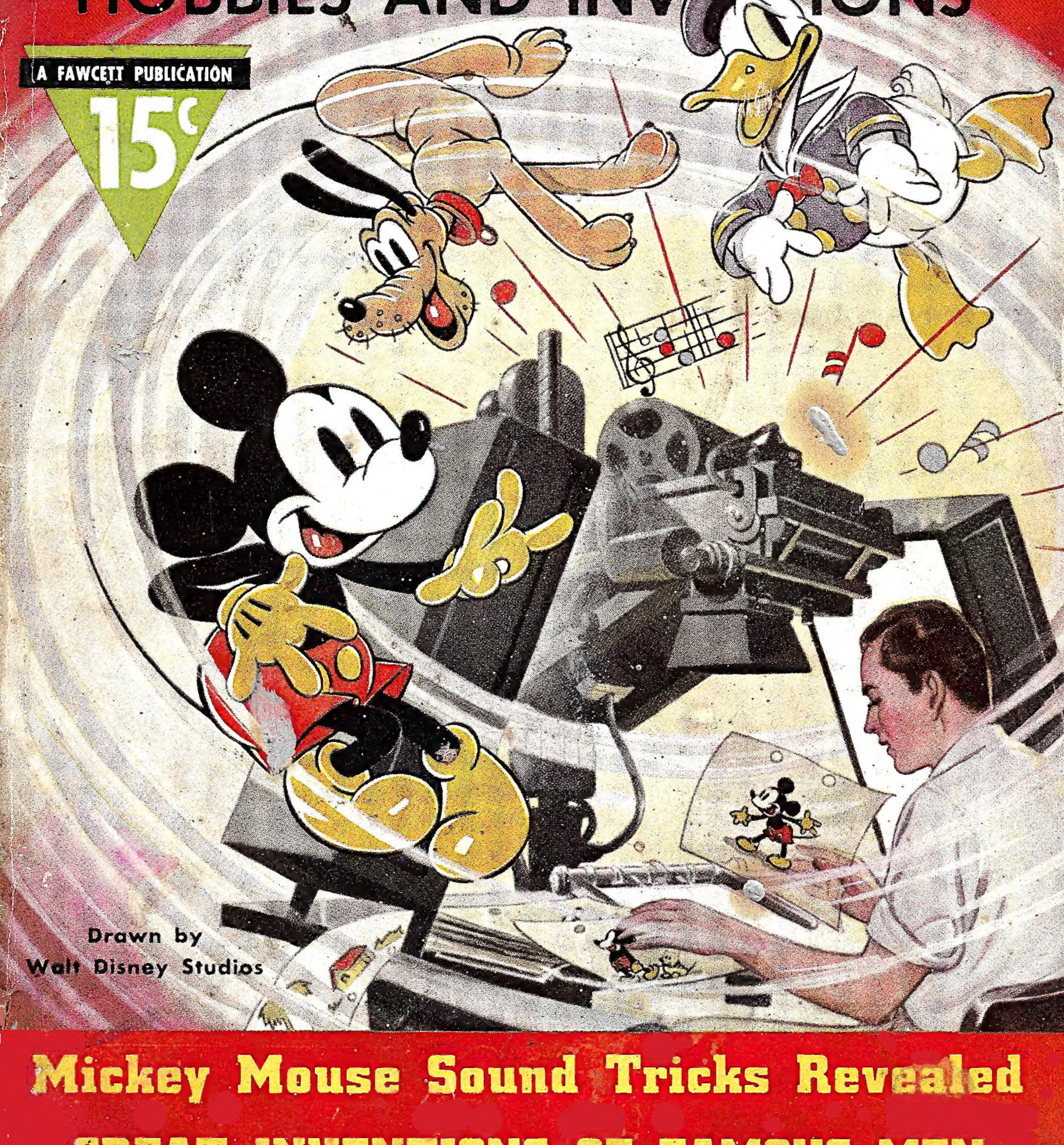
JANUARY
NSC

MODERN MECHANIX

HOBBIES AND INVENTIONS

A FAWCETT PUBLICATION
15c



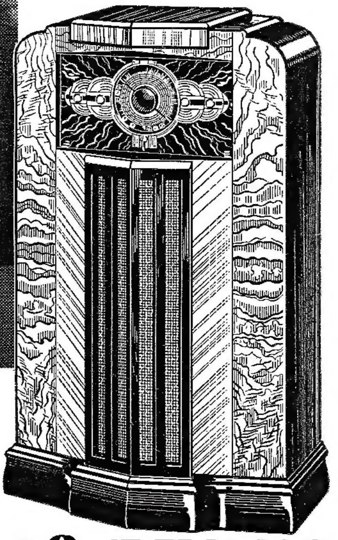
Drawn by
Walt Disney Studios

Mickey Mouse Sound Tricks Revealed

GREAT INVENTIONS OF FAMOUS MEN

SAVE UP TO 50% DIRECT FROM MIDWEST FACTORY!

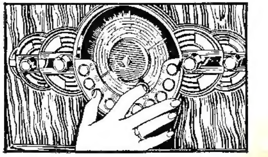
"I REMEMBER WHEN RADIO FIRST STARTED... EVEN THEN MIDWEST WAS KNOWN FOR ITS *Power* AND *Beauty!*"



MAIL COUPON *Now* FOR NEW *FREE* 40-PAGE CATALOG

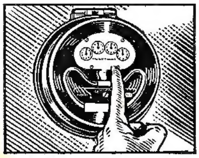
Mail coupon today for new, FREE 40-page catalog...and learn how you can save up to 50% by buying direct from Midwest factory. See for yourself that Midwest offers today's greatest radio values, and scores of exciting features, like Dial-A-Matic Tuning, plus Electrik-Saver. With the sensational Dial-A-Matic Tuning feature, for example, even a child can bring in ten perfectly tuned programs in ten seconds. Zip! . . . Zip! . . . Zip! . . . stations come in instantly, automatically, perfectly . . . as fast as you can push buttons. The exclusive Midwest Electrik-Saver cuts radio wattage consumption 50%, enables Midwest radios to use no more current than ordinary 7-tube sets.

ONLY IN MIDWEST DO YOU GET DIAL-A-MATIC TUNING *plus* ELECTRIK-SAVER



DIAL-A-MATIC TUNING

Now, even a child can bring in ten perfectly tuned programs in ten seconds! It's a big thrill to whirl the dial . . . and then hear the station you want . . . come in instantly, automatically . . . as fast as you can press buttons!



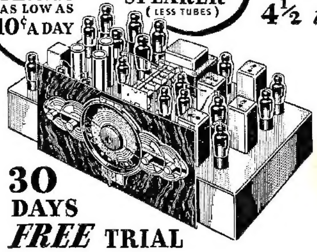
ELECTRIK-SAVER

This exclusive Midwest feature cuts radio wattage consumption 50% . . . results in Midwest radios using no more current than ordinary 7-tube set . . . enables you to operate on voltages as low as 80 volts.

MIDWEST RADIO CORP.
DEPT. G-10 CINCINNATI, OHIO, U.S.A.
Established 1920 Cable Address MIRACO...All Codes

Only $59.50 COMPLETE *with* GIANT THEATRE-SONIC SPEAKER (LESS TUBES)

TERMS AS LOW AS 10¢ A DAY



18 TUBES
SIX WAVE BANDS
4½ *to* 2400 METERS

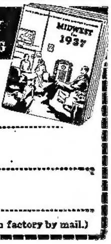
Bigger, better, more powerful, more beautiful, this super deluxe Midwest out-performs $150 sets on a point-for-point comparison. Amazingly selective, delicately sensitive, it brings in distant foreign stations with full loud speaker volume on channels adjacent to powerful locals. You'll thrill over its marvelous super-performance...glorious crystal-clear "concert realism" . . . magnificent world-wide foreign reception. Powerful Triple-Twin tubes (two tubes in one) give 22-tube results.

You can switch instantly from American programs . . . to Canadian, police, amateur, commercial, airplane, ship broadcasts . . . to the finest and most fascinating foreign programs. Never before so much radio for so little money. Why pay more? Save up to 50% by buying at wholesale . . direct from factory...preferred by thousands of careful radio purchasers since 1920.

30 DAYS *FREE* TRIAL

You have a year to pay...terms as low as 10c a day...you secure privilege of 30 days' FREE trial in your own home. In addition, you are triply protected with Foreign Reception Guarantee, One-Year Warranty and Money-Back Guarantee.

MAIL COUPON TODAY FOR *FREE* 30-DAY TRIAL OFFER *AND* 40-PAGE FOUR-COLOR *FREE* CATALOG



MIDWEST RADIO CORPORATION
Dept. G-10
Cincinnati, Ohio
Without obligation on my part, send me your new FREE catalog and complete details of your liberal 30-day FREE trial offer. This is NOT an order.

Name..

Address..

Town..............................State..............................

(Special offer and prices prevail only when dealing direct with factory by mail.)

What will you be doing—ONE YEAR FROM TODAY?

THREE hundred and sixty-five days from now—what?

Will you still be struggling along in the same old job at the same old salary—worried about the future—never able to make both ends meet?

One year from today will you still be putting off your start toward success—thrilled with ambition one moment and then cold the next—delaying, waiting, fiddling away the precious hours that will never come again?

Don't do it, man—don't do it.

There is no greater tragedy in the world than that of a man who stays in the rut all his life, when with just a little effort he could advance.

Make up your mind today that you're going to train yourself to do some one thing well. Choose the work you like best in the list below, mark an X beside it, and, without cost or obligation, at least get the full story of what the I. C. S. can do for you.

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 2320-K, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X: ★

TECHNICAL AND INDUSTRIAL COURSES

- ☐ Architect
- ☐ Architectural Draftsman
- ☐ Building Estimating
- ☐ Contractor and Builder
- ☐ Structural Draftsman
- ☐ Structural Engineer
- ☐ Management of Inventions
- ☐ Electrical Engineer
- ☐ Electric Lighting
- ☐ Welding, Electric and Gas
- ☐ Reading Shop Blueprints
- ☐ Heat Treatment of Metals
- ☐ Sheet Metal Worker
- ☐ Boilermaker
- ☐ Telegraph Engineer
- ☐ Telephone Work ☐ Radio
- ☐ Mechanical Engineering
- ☐ Mechanical Draftsman
- ☐ Machinist ☐ Toolmaker
- ☐ Patternmaker
- ☐ Diesel Engines
- ☐ Aviation Engines
- ☐ Automobile Mechanic
- ☐ Refrigeration
- ☐ Plumbing ☐ Steam Fitting
- ☐ Heating ☐ Ventilation
- ☐ Air Conditioning
- ☐ Steam Engineer
- ☐ Steam Electric Engineer
- ☐ Marine Engineer
- ☐ R. R. Locomotives
- ☐ R. R. Section Foreman
- ☐ Air Brakes ☐ R. R. Signalmen
- ☐ Highway Engineering
- ☐ Civil Engineering
- ☐ Surveying and Mapping
- ☐ Bridge Engineer
- ☐ Bridge and Building Foreman
- ☐ Chemistry
- ☐ Pharmacy
- ☐ Coal Mining
- ☐ Mine Foreman ☐ Fire Bosses
- ☐ Navigation
- ☐ Cotton Manufacturing
- ☐ Woolen Manufacturing
- ☐ Agriculture
- ☐ Fruit Growing
- ☐ Poultry Farming

BUSINESS TRAINING COURSES

- ☐ Business Management
- ☐ Industrial Management
- ☐ Traffic Management
- ☐ Accountancy
- ☐ Cost Accountant
- ☐ C. P. Accountant
- ☐ Bookkeeping
- ☐ Secretarial Work
- ☐ Spanish
- ☐ French
- ☐ Salesmanship
- ☐ Advertising
- ☐ Service Station Salesmanship
- ☐ First Year College Subjects
- ☐ Business Correspondence
- ☐ Stenography and Typing
- ☐ Civil Service ☐ Mail Carrier
- ☐ Railway Mail Clerk
- ☐ Grade School Subjects
- ☐ High School Subjects
- ☐ College Preparatory
- ☐ Illustrating
- ☐ Cartooning
- ☐ Lettering Show Cards ☐ Signs

DOMESTIC SCIENCE COURSES

- ☐ Home Dressmaking
- ☐ Professional Dressmaking and Designing
- ☐ Advanced Dressmaking
- ☐ Millinery
- ☐ Tea Room and Cafeteria Management, Catering
- ☐ Foods and Cookery

Name..............................*Age*..............*Address*..............................

City..............................*State*..............*Present Position*..............................

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

PRICE
15 CENTS

SAME PRICE
IN CANADA

MODERN MECHANIX
HOBBIES & INVENTIONS

JANUARY
1937

Volume XVII
Number 3

CONTENTS

SPECIAL FEATURES

Work Starts On MM Home - - - 36

By Wesley Sherwood Bessell, Noted New York Architect

Great Inventions of Famous Men - - - 42

By Aubrey D. McFadyen

Around the World by Air - - - - - 50

By H. R. Ekins, Reporter, First Man to Circle Globe by Air Lines

Behind the Razor Blade - - - - - 58

By Robert W. Gordon

Sound Tricks of Mickey Mouse - - - 68

By Earl Theisen, Illustrated by Walt Disney

Tackle for Salt Water Fishing - - - 76

By Robert Page Lincoln

Glacier Priest Maps Roof of the World - - 82

By James N. Miller

Bethlehem Opens New $20,000,000 Mill - 86

By Watson Davis

[*Continued on page* 10]

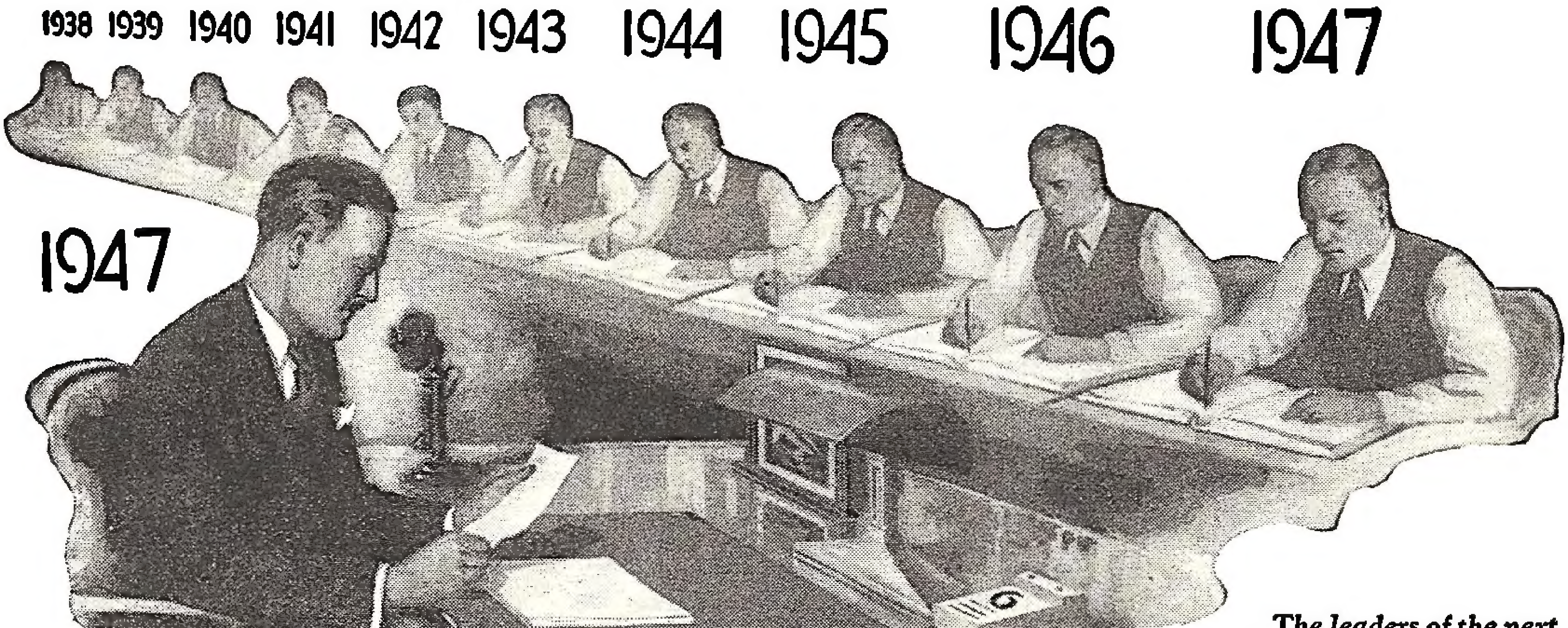
NEXT MONTH

Dr. Miller McClintock, noted Harvard University authority on traffic regulation, tells MM readers how effective traffic control can be accomplished through engineering. His timely article expounds ways and means by which crowded cities can convert their present inadequate highways into thoroughfares featuring maximum safety for motorists and pedestrians alike. Don't fail to read this authentic solution to a modern problem.

FOR WORKSHOP FANS

Among the highly interesting projects scheduled for the February issue there will be plans for building an Aero-Drive Ice Sled, an All-Purpose Desk, 2-Tube Metal-Glass All-Wave Radio, Electric Reactance Coil Experiments, and many other workshop plans, suggestions, and time saving kinks.

Published monthly by Modern Mechanix Publishing Co. at Broadway and 11th St., Louisville, Ky., U. S. A. Entered as second-class matter under the act of March 3, 1879, at the post office in Louisville, Ky., with additional entry at Greenwich, Conn. Copyright 1936 by Modern Mechanix Publishing Co. Editorial offices, 22 West Putnam Ave., Greenwich, Conn. Address all manuscripts to Modern Mechanix Hobbies & Inventions, at the Greenwich, Conn., address. Not responsible for unsolicited manuscripts. Contributions accompanied by insufficient postage will not be returned. In U. S. and Possessions and in Canada, 15c a copy; $1.50 a year. Other Postal Unions, $2.00 a year. Printed in U. S. A. Advertising forms close the first of second month preceding date of issue. Advertising offices: New York, 1501 Broadway; Chicago, 360 N. Michigan Ave.; San Francisco, Simpson-Reilly, 1014 Russ Bldg.; Los Angeles, Simpson-Reilly, 536 S. Hill St. Member Audit Bureau of Circulations. **Managing Editor,** William Kostka; **Editor,** Tom Mahoney; **Associate Editors,** Thomas A. Blanchard, John L. Scherer, Walker Matheson; **Hunting and Fishing Editor,** Robert Page Lincoln; **Naval Architect,** S. S. Rabl.



The leaders of the next ten years will largely be determined in the next ten months. Will you be one of them?

Will You Be Clerk or Manager
Ten Years from Now?

"SURELY, this could never happen to *me*," you say—"that I should be sitting at the same desk—be doing the same work—*for ten straight years!*"

But wait a minute—

Exactly that same thing has happened to thousands upon thousands of men. It has probably happened to men right in the company you now are working for. *And —unless you fit yourself for a better job—there is a very good chance that it may happen to you!*

Unthinkable? That's what J. N. Dixon of Columbus, Ohio, said to himself. Yet lack of training kept him slaving away at low wages for a long time.

TRIPLES INCOME

Here is Mr. Dixon's own story—"Just after I returned from the war, one of your representatives found me plugging away at a bookkeeper's job in Marietta, Ohio. He performed a real service and explained to me the need of further training, and induced me to take the LaSalle training in Higher Accountancy. After a few months of study, I secured a position with the Trust Department of a National Bank. This was the stepping stone I needed to various responsible positions including handling of receiverships and other important duties. That quickly boosted my income several hundred percent."

ANOTHER AMAZING SUCCESS STORY

If you think Mr. Dixon's success story unusual, please read what J. H. Krouse of Memphis, Tennessee, says. "When I decided to take your training in Higher Accountancy, I was a clerk. Today I am Chief Consultant Accountant for the U. S. Engineer's Office in Memphis, Tenn. Whatever success or recognition I have had, I owe to your training. I have had no other specialized training along this line. Your method of teaching is not only instructive but highly engaging. I have observed other courses, but firmly believe LaSalle has the best to be had anywhere."

Another bit of proof is Mr. R. P. Barthalow's experience. Mr. Barthalow is Chief of the Sales Tax Section of the Tax Commission of Ohio. A department which handles over $50,000,000 a year. Mr. Barthalow attributes much of his success to LaSalle training.

SEND FOR These Two Books and Start Toward Bigger Success

Need you hear more before you investigate the opportunities in Accountancy?

Or will you face the problem of your future NOW—and send to LaSalle and get further facts and particulars?

Without cost or obligation, the coupon will bring you two interesting books—one a 64-page book entitled, "Accountancy, the Profession that Pays"; the other "Ten Years' Promotion in One."

How about those next ten years—will you wait or will you START TODAY to realize the tremendous opportunities that lie ahead of you through sound and practical home-study business training?

Measure your grit and ambition by what you do with this coupon—NOW.

LaSalle Extension University

LASALLE EXTENSION UNIVERSITY, Dept. 1493-HR CHICAGO

Opportunities in Accountancy—Check below and we will send you a copy of "Accountancy, the Profession that Pays," also copy of "Ten Years' Promotion in One," all without obligation.

☐ **Higher Accountancy:** Leading to position as Auditor, Comptroller, Certified Public Accountant, Cost Accountant, etc.

Other LaSalle Opportunities: If more interested in one of the other fields of business indicated below, check that.

☐ Business Management
☐ Expert Bookkeeping
☐ C. P. A. Coaching
☐ Modern Salesmanship
☐ Traffic Management
☐ Law: Degree of LL. B.
☐ Industrial Management
☐ Personnel Management
☐ Modern Business Correspondence
☐ Stenotypy
☐ Business English
☐ Commercial Law
☐ Effective Speaking

Ten years' promotion in one
Accountancy

Name ____________________

Present Position ____________________ *Address* ____________________

J. E. SMITH, Pres., Natl. Radio Institute
The man who has directed the home study training of more men for the Radio Industry than any other man in America.

BE A RADIO

MANY MAKE $30 $50 $75 A WEEK

I Will Train You at Home—mail coupon for FREE Book

Do you want to make more money? Radio offers you many opportunities for well-paying spare time and full time jobs. And you don't have to give up your present job or leave home and spend a lot of money to become a Radio Expert.

Many Radio Experts Make $30, $50, $75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as $30, $50, $75 a week. Many Radio Experts operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Radio operators on ships get good pay and see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I have trained are holding good jobs in these branches of Radio. Read their statements. Mail the coupon.

There's a Real Future in Radio for Well-Trained Men

Radio already gives jobs to more than 300,000 people. In 1935 over $300,000,000 worth of sets, tubes and parts were sold—an increase of 20% over 1934! Over 1,100,000 auto Radios were sold in 1935, 25% more than in 1934! 22,000,000 homes are today equipped with Radios, and every year millions of these sets go out of date and are replaced with newer models. Millions more need servicing, new tubes, repairs, etc. Broadcasting stations pay their employees (exclusive of artists) more than $23,000,000 a year! And Radio is a new industry, still growing fast! A few hundred $30, $50, $75-a-week jobs have grown to thousands in less than 20 years!

Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

Practically every neighborhood needs a good spare time serviceman. The day you enroll I start sending you Extra Money Job Sheets. They show you how to do Radio repair jobs that you can cash in on quickly! Throughout your training I send you plans that made good spare time money—$200 to $500 a year—for hundreds of fellows. My training is famous as "the Course that pays for itself."

THE TESTED WAY TO

HERE'S PROOF THAT MY TRAINING PAYS

Chief Operator Broadcasting Station

"When I completed 20 lessons, I obtained my Radio Broadcast Operator's license and immediately joined Station WMPC, where I am now Chief Operator."—HOLLIS F. HAYES, 85 Madison St., Lapeer, Mich.

$10 Week in Spare Time

"My work has consisted of Radio set servicing, with some Public Address Systems work—all in my spare time. My earnings in Radio amount to about $10 a week."—WILLIAM MEYER, 705 Ridge Road, Hobart, Ind.

Service Manager For Four Stores

"I was working in a garage when I enrolled with N. R. I. In a few months I made enough to pay for the course three or four times. I am now Radio service manager for the M—— Furniture Co., for their four stores."—JAMES E. RYAN, 1535 Slade St., Fall River, Mass.

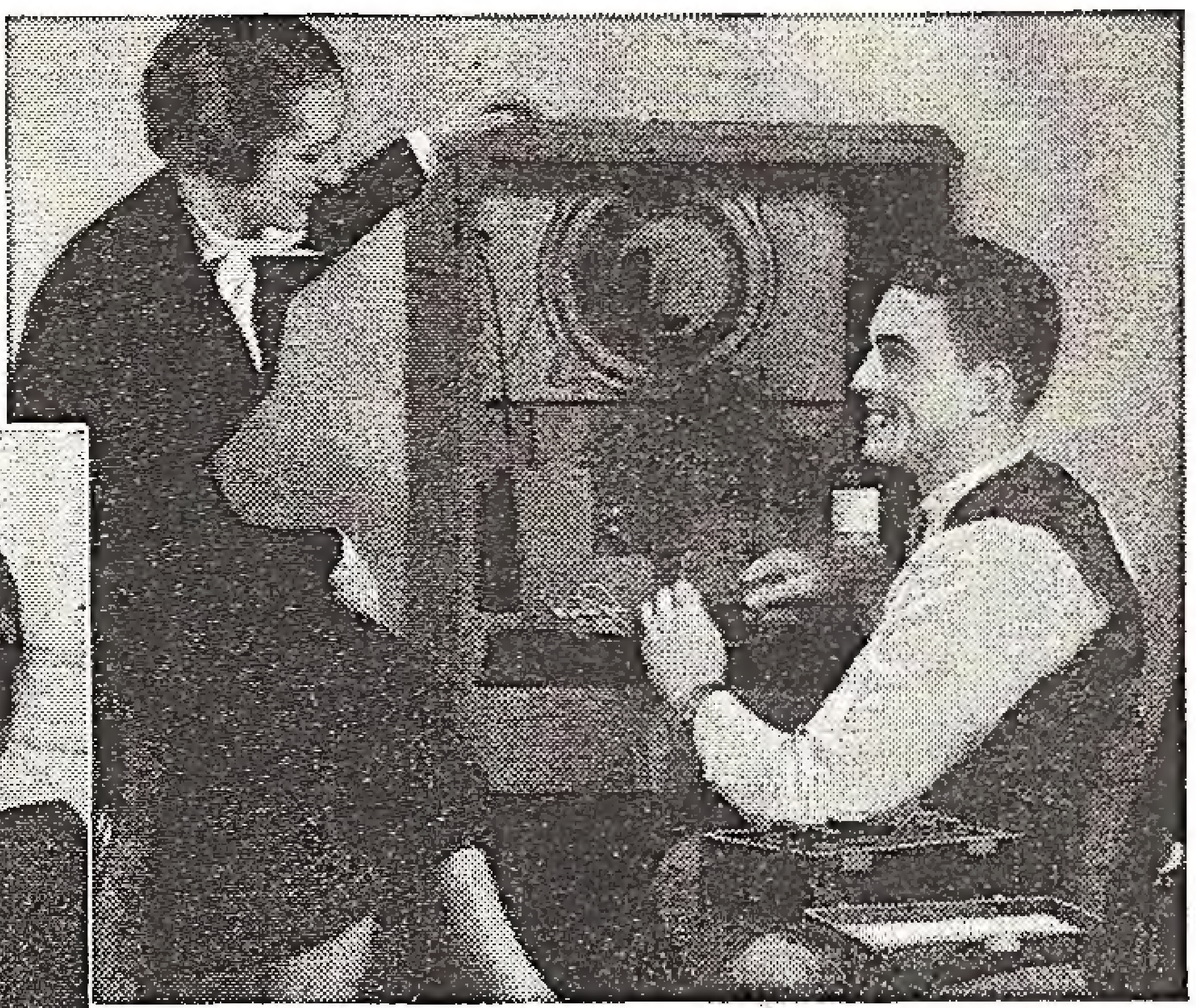
Own Business Pays $300 a Month

"I now have my own Radio business which shows three hundred dollars a month profit—thanks again to National Radio."—FRANK T. REESE, 39 N. Felton St., Philadelphia, Penna.

Earned $50 First Month in Spare Time

"I knew nothing about Radio. After four lessons I began servicing Radios, earning $50 the first month. Last winter I made as high as $100 a month in spare time."—G. F. WALTON, 808 West Olney Road, Norfolk, Va.

EXPERT

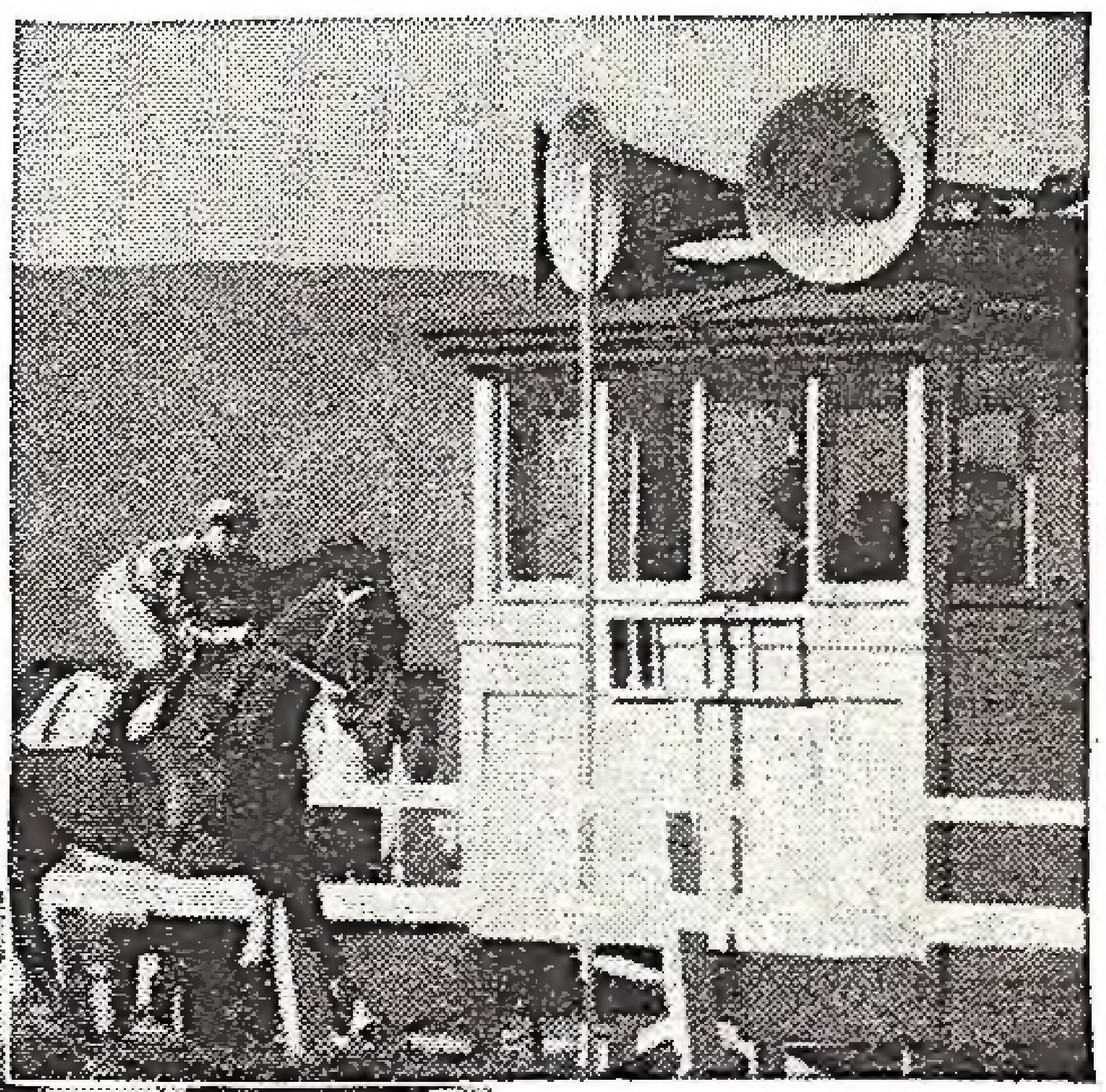


Set Servicing

Spare time set servicing pays many $5, $10, $15 a week extra while learning. Full time servicing pays as much as $30, $50, $75 a week.

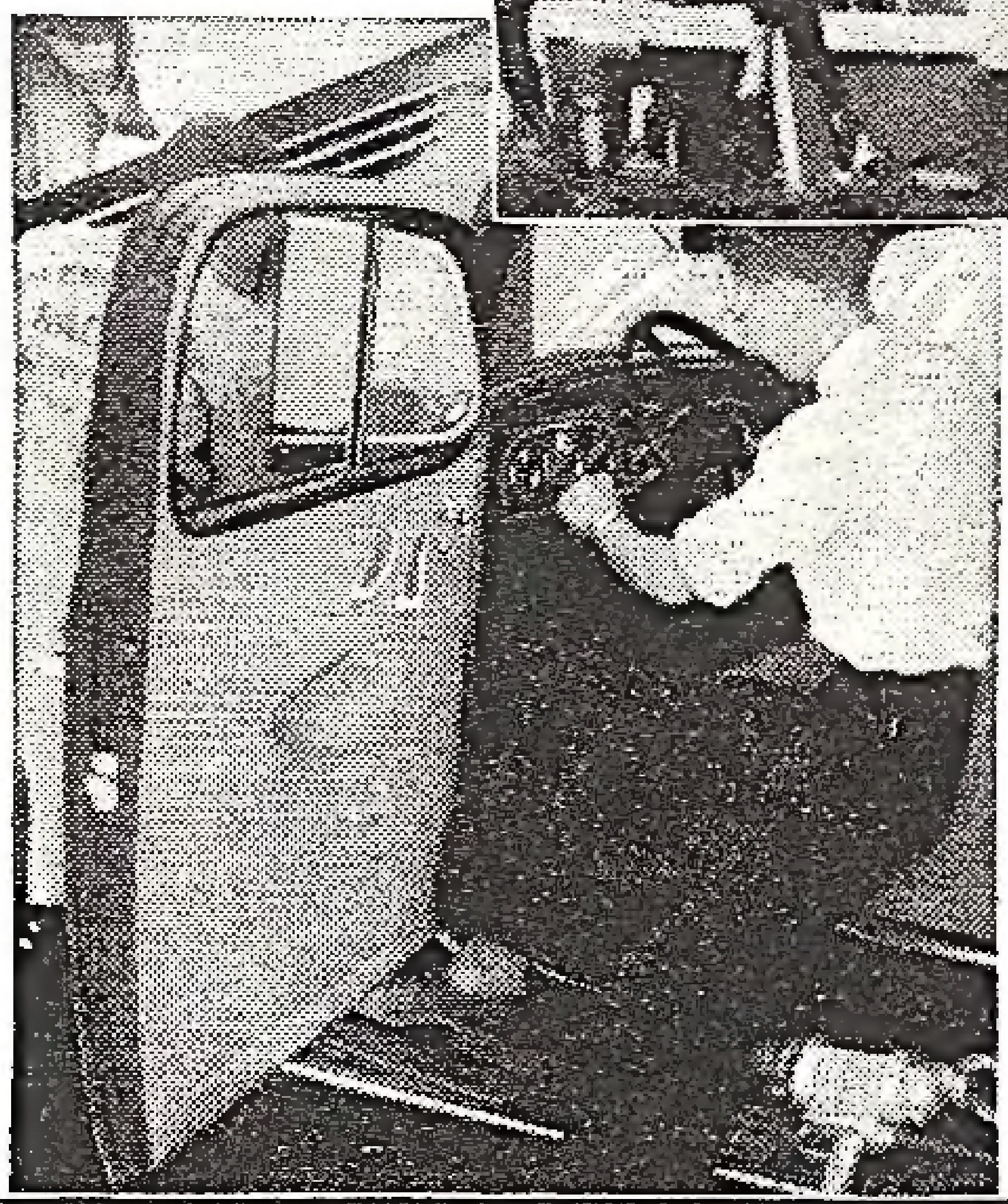
Broadcasting Stations

Employ managers, engineers, operators, installation and maintenance men for fascinating jobs and pay up to $5,000 a year.



Loud Speaker Systems

Building, installing, servicing and operating public address systems is another growing field for men well trained in Radio.



Automobile Radio

Another new Radio field — selling, installing, servicing. One million or more auto owners will install radio sets within the next year.

I Give You Practical Experience

My Course is not all book training. I send you special Radio equipment and show you how to conduct experiments and build circuits which illustrate important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus for use in spare time work from this equipment. This 50-50 method of training makes learning at home interesting, fascinating, practical.

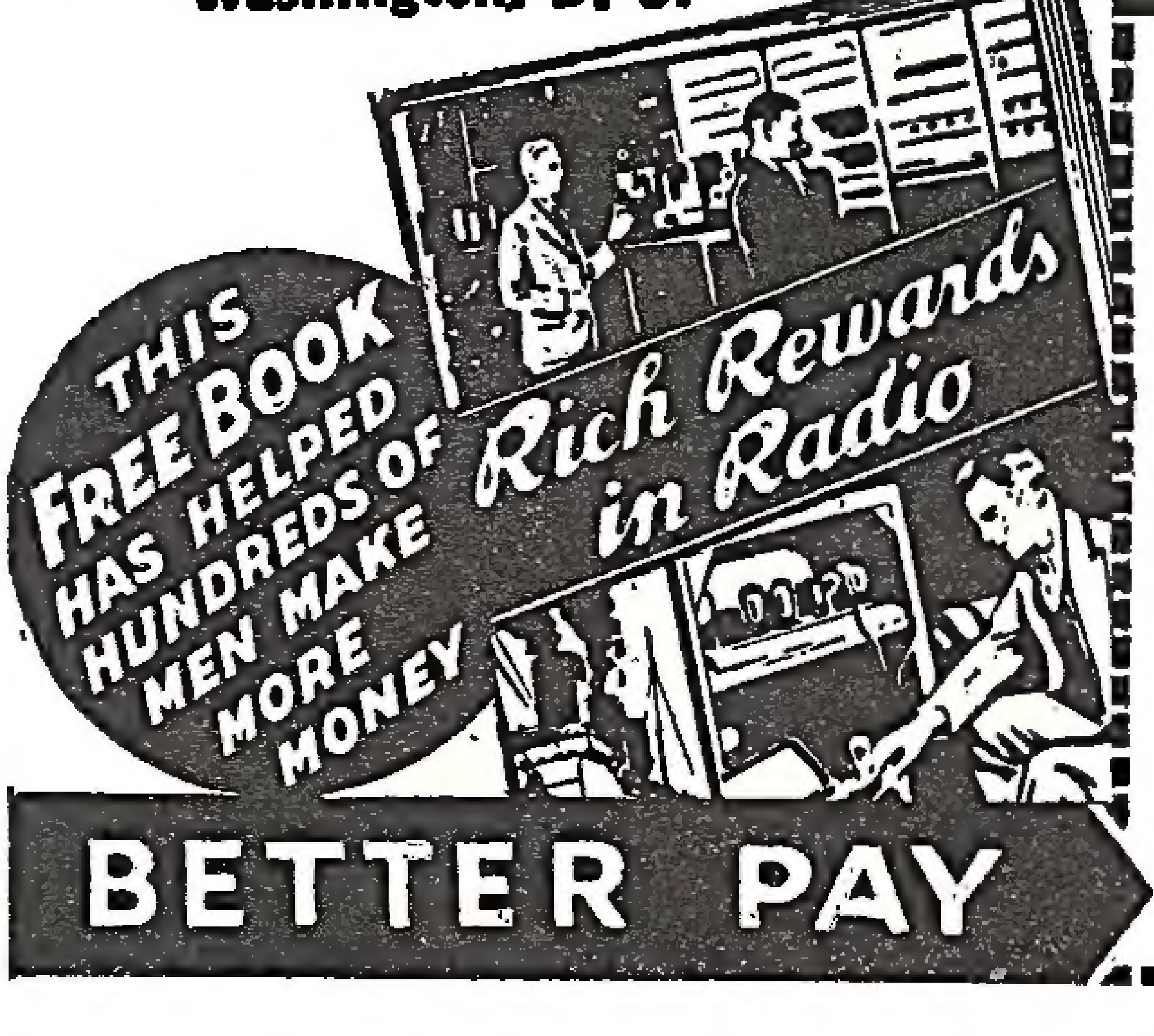
You Get a Money-Back Agreement

I am so sure that I can train you successfully that I agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish. I'll send you a copy of this agreement with my Free Book.

Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It describes Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you actual letters from men I have trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste on a postcard—NOW!

J. E. SMITH, Pres.,
National Radio Institute, Dept. 7AH
Washington, D. C.



THIS FREE BOOK HAS HELPED HUNDREDS OF MEN MAKE MORE MONEY
Rich Rewards in Radio
BETTER PAY

Mail this to get 64 page Book FREE

Mr. J. E. SMITH, President, Dept. 7AH
National Radio Institute, Washington, D. C.

Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

NAME ....AGE ....

ADDRESS ....

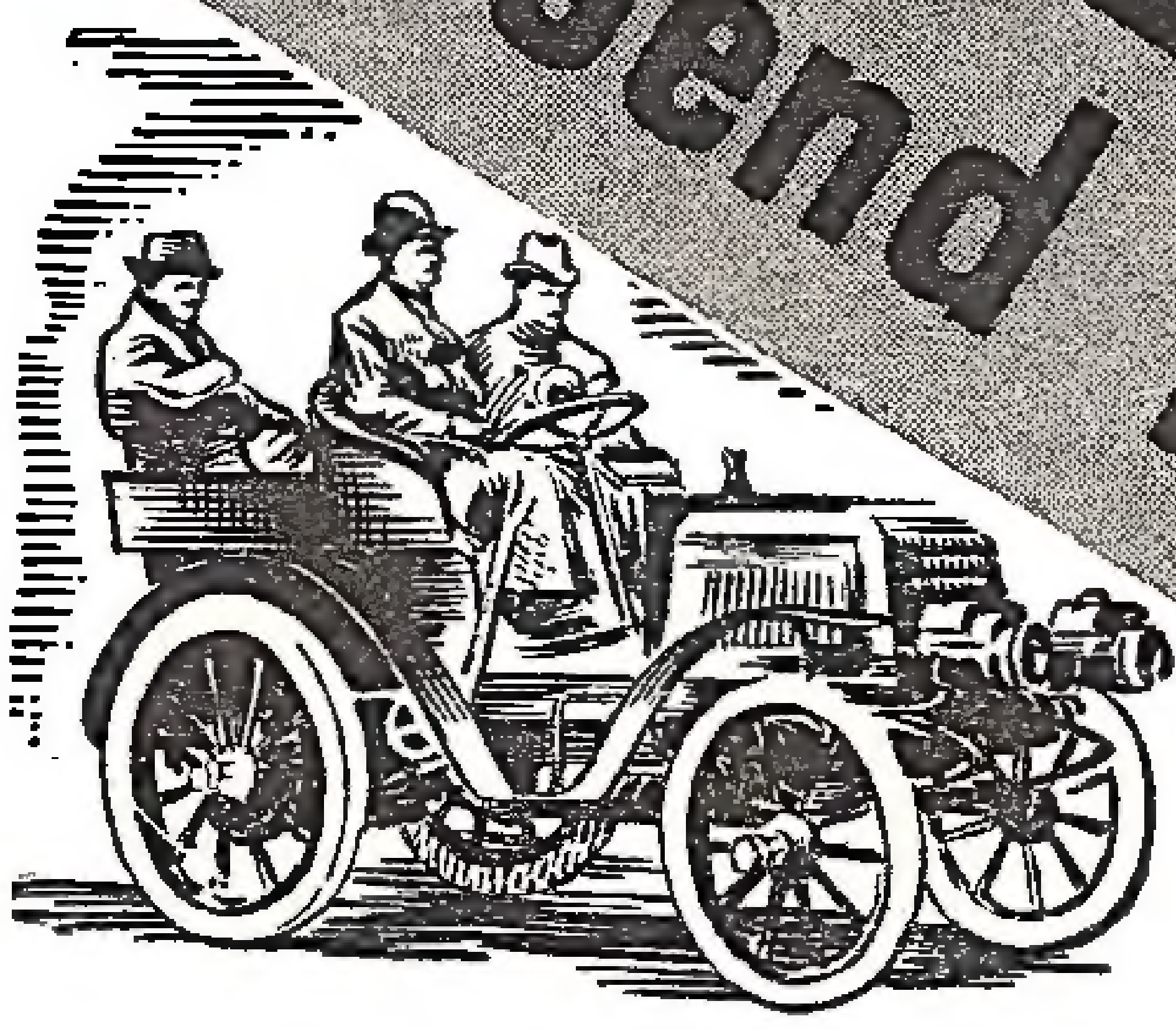
CITY ....STATE ....

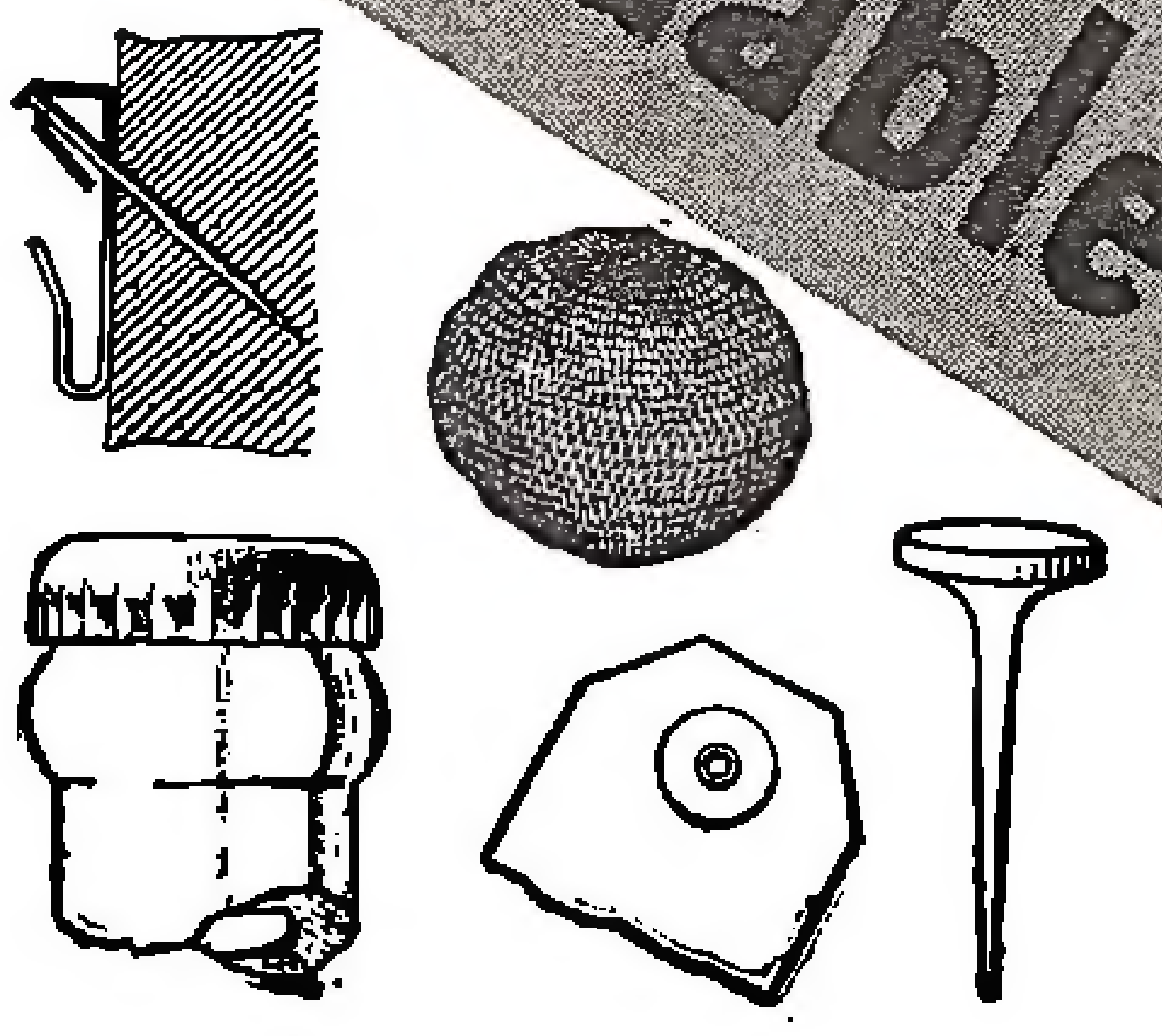
David Sarnoff says:

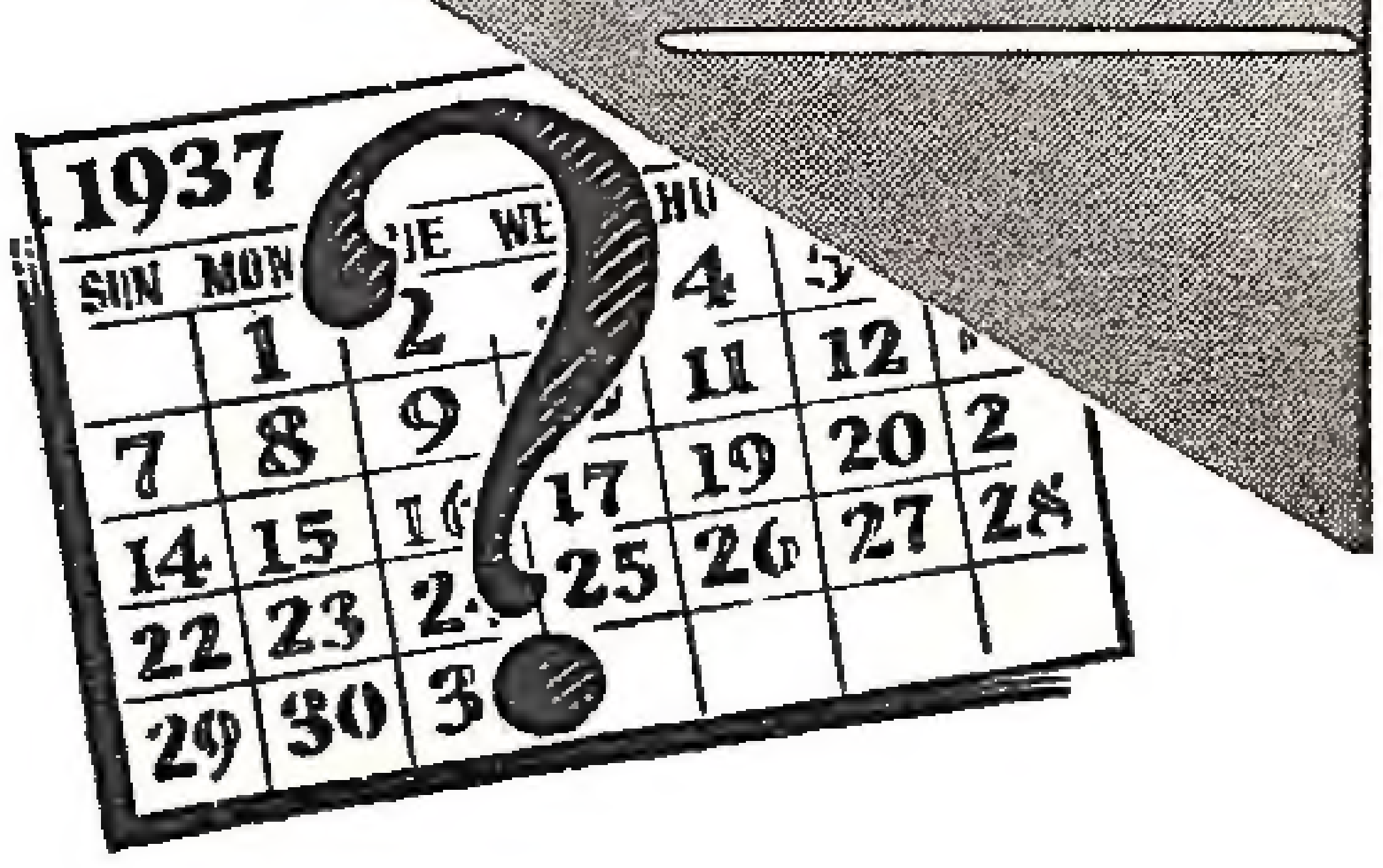
INVENTORS

Send for Valuable Facts *about*

DAVID SARNOFF, once a poor lad and now the famous President of the Radio Corporation of America, in an article in Liberty Magazine states: "Civilization means elimination of unnecessary labor. The sewing machine and the vacuum cleaner save millions of women from backbreaking toil. The tractor makes the farmer's life bearable. The automobile lends wings to us all. The airplane is our magic carpet. It would be madness to slow up invention because our trouble is not that mechanical science moves too speedily, but that the governmental and social sciences move too slowly . . . In a world reorganized to vibrate within certain wave bands, human intelligence will be able to distribute equitably nature's bounties from above and below, and make princes of paupers."







Since the "Horseless Buggy" Days, We Have Helped Inventors

PERHAPS you have already heard about our firm, because one client tells another—and we have served men in every state in the Union, and in nearly every foreign country. We have been working with inventors since 1898. If you have a good invention—or an idea for one—and don't know what Victor J. Evans & Co. can do for you, NOW is the time to find out.

How We Can Help You

Both the Patent Office and the U. S. Supreme Court have made it clear that the inventor needs the assistance of a competent patent lawyer when it comes to protecting an invention. It is one thing to think up a good invention—it is another to get effective patent protection on it.

For more than a third of a century—it has been our business to give sound advice and counsel to inventors. Our free books (described on the opposite page) tell what steps to take first, how to protect yourself, how the laws protect you, what you must do, when to offer your invention for sale, how others have succeeded, and much more. You need this information.

Simple Inventions May Have Excellent Commercial Possibilities

FREQUENTLY inventors confuse the size or the complication of a device with the question of commercial value and patentability. These two factors, of course, have no relation to each other. Most of our present-day complicated machines represent a process of evolution, a series of inventions. On the other hand, every so often some inventor comes along with a very simple "gadget" which possesses the elements of broad utility and is patentable. Some of the most profitable inventions have been of this latter class. Shown above are a few such examples. Whether a device is simple or complex, if it represents a forward step to save manufacturing costs, to save labor, or to add enjoyment to human life, it may prove patentable and profitable. This subject is more fully discussed in the booklet entitled "Patent Protection" shown on the opposite page.

What Will Be Next?

EVER since George Washington signed the first patent, America has led the world in inventions. It may be said that not a year has gone by without some important inventions being patented and commercialized. David Sarnoff, president of the Radio Corporation of America, sees a big future ahead for science and invention. Just as sure as the sunrise, 1937 will see new inventions come out—new wealth made from patents. Your idea may be one of them. You never can tell. For this reason you should send for our books today and get the facts about patents and inventions.

Learn how our patent laws protect you

These FREE books tell you

Get the answers to your questions: How can I protect my invention? When can I show my invention to manufacturers? When can I offer it for sale? How should I go about selling it? Can I get protection without a patent? What are my employer's rights? These and other important questions are fully answered.

The U. S. has liberal patent laws, and much of our national wealth is based on patents. In fact, a Japanese commission decided that American progress was mainly due to our patent laws. These laws are made to protect you. Find out about them now. This is for your own good.

PATENT PROTECTION
Suggestions on WHEN and HOW to Sell an INVENTION
PATENTS and Selling Inventions

Mail Coupon Today

Delays are dangerous. If you have a good invention you should get protection for it just as soon as possible. Don't turn this page until you have clipped and mailed this coupon—you will hear from us by return mail.

115 Mechanical Principles Shown

Request the book "Patent Protection" (sent free to inventors). Not only does it tell you what to do for protection, and how to do it—it also shows you 115 different mechanical movements that you may use in developing your own inventions. Inventors tell us they have found these useful.

VICTOR J. EVANS & Co.

REGISTERED PATENT ATTORNEYS

MAIN OFFICE: 220-A, VICTOR BUILDING, WASHINGTON, D. C.

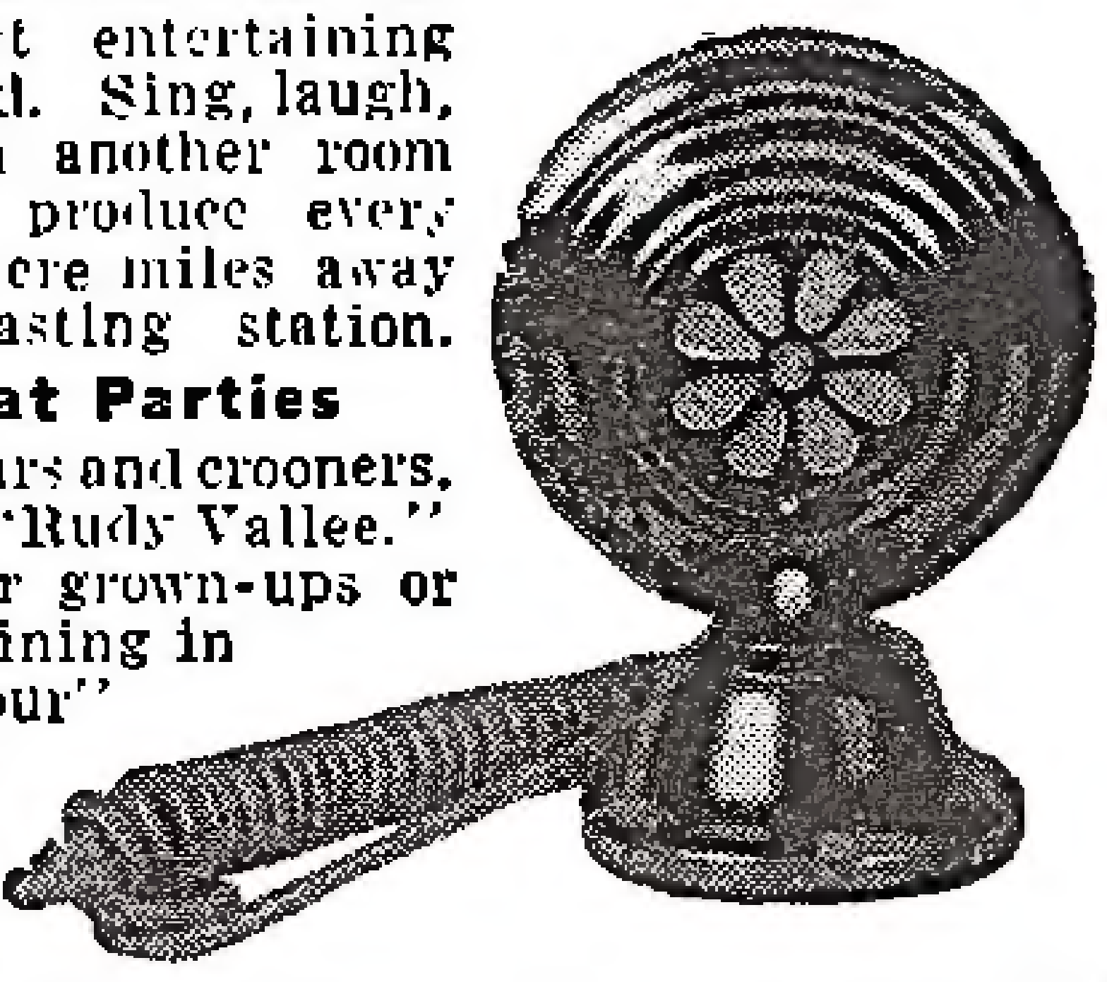
Other Offices: 1007-B, Woolworth Bldg., **New York**; 1445-B, Monadnock Bldg., **Chicago**; 514-B, Empire Bldg., **Pittsburgh**; 1010-B, Hobart Bldg., **San Francisco**; 736-B, Security Bldg., **Los Angeles.**

Send me FREE copies of your books, "Patent Protection" and "When and How to Sell an Invention." (Note: Same books supplied by any of branch offices listed above.)

Name ....

Street and No. ....

City or Town ....



BROADCAST
and AMAZE
Your Friends!

Put on your own broadcast with the WALCO MIKE, most entertaining radio device yet produced. Sing, laugh, talk, crack jokes from another room and your radio will produce every sound as though you were miles away at a regular broadcasting station.

Marvelous Fun at Parties

Imitate the big radio stars and crooners. Do a "Ben Bernie" or "Rudy Vallee." No end of pleasure for grown-ups or kiddles. Excellent training in elocution, "Amateur Hour" practice, or broadcast announcing. Special cut-out button allows you to switch from home broadcasting to regular radio reception in an instant. Can not injure your radio in any way.

Send No Money

5 Days Trial at Our Risk
Merely mail the coupon. On delivery pay postman $1 plus few cents postage. If not delighted return it in 5 days and your $1 refunded at once.

THE WALCO MIKE
In handsome black metal. Long cord. Less than a minute to attach to any radio without tools. Fully guaranteed.
ONLY $1

ELECTRICAL LABORATOR ES CO., Dept. 61
49 East 21st St., New York, N. Y.

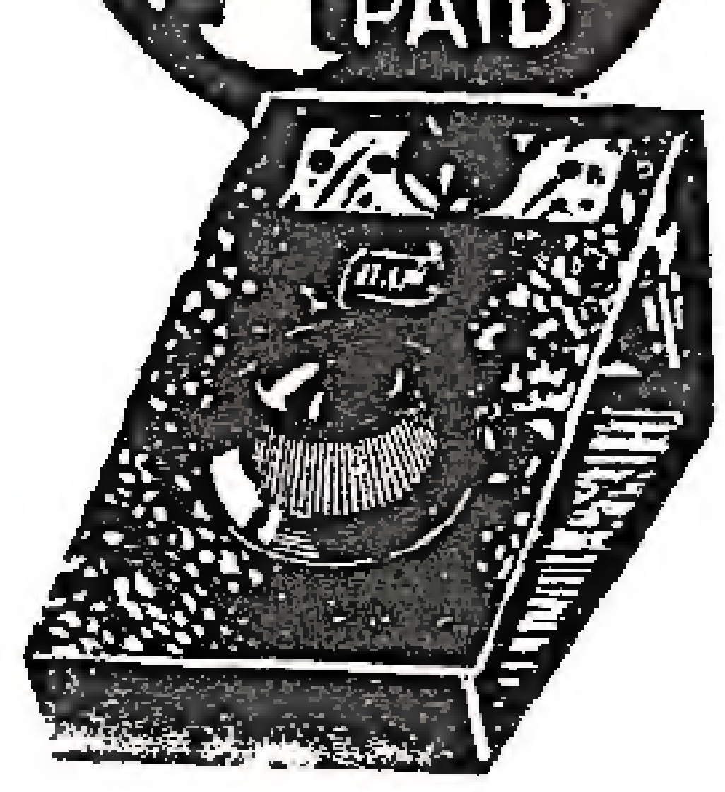
Send Walco Mike, with complete instructions. Will pay postman $1, plus few cents postage. If not delighted, will return in 5 days for $1 refund.

☐ Check here if ENCLOSING $1—thus saving postage charge. Same refund guarantee applies.

Name ________________________________

Address ______________________________

☐ Check here if you prefer chromium plated De Luxe model. Price $1.39.



FUN for EVERYONE
OWN a 1-TUBE WORLD WIDE Ace RADIO

ONLY $1.55 POST PAID

Not a feeble crystal set. Thousands now in use. Can actually bring in foreign stations, police calls, aeroplanes, amateurs, etc., as well as local broadcasts! Ace Radios give guaranteed results!

For only $1.55 we send you the complete kit containing an attractive metal chassis panel and every part needed to build a powerful one-tube receiver. AMAZING VALUE! Works for months on two inexpensive dry batteries. Our clear diagrams make it simple to hook up. (Set laboratory assembled and wired 75c extra).

Enjoy NEW thrills! Send for your ACE Radio today!

ACE RADIO LABORATORIES,
70 Barclay St., Dept. MX-1, New York

ARTCO
ROTARY FILES

GENUINE ARTCO CUTTING TOOLS GIVE YOU SATISFACTORY SERVICE

SAVE UP TO 50% Now

Special Offer 6 different cutters as shown; finest steel for filing, carving, cutting, engraving on all woods, plastics, metals (1/8"x1 1/2" shanks). Fit all hand grinders and stationary machines. Keen, sharp edges. When prepaid we pay the postage.

ONLY $3.20 REG. $5 VALUE

SEND FOR FREE BOOK

Over 500 shapes available. Largest stock in America. Dealers get our profitable proposition.

AMERICAN ROTARY TOOLS CO., INC.
44 Whitehall St., Dept. C-5, N. Y. City

CONTENTS—Continued from page 4

SHORTER FEATURES

Chemists For Industry—A Guest Editorial - 35
By Emile F. du Pont, Personnel Manager, E. I. du Pont de Nemours & Co.
Proving Women Also Have Ideas - - - - 46
Last Minute Gift Suggestions - - - - - 48
Love Of Man For Dogs Expressed In Building Canine Cemeteries - - - - - - - - - 55
More Marvels In 1937 Cars - - - - - - 56
Are We Drifting To China? - - - - - - 57
Women Head Winner's List in MM Inventions Contest - - - - - - - - - - - - - 62
America's Newest Auto Race Track - - - 64
Aerial Medical Service - - - - - - - 66
Fancy Skating - - - - - - - - - - - 74
Workshop Fan Builds Attractive Home - - 81
Harbor Tugs Talk To Shore By Phone - - 84
Micro-Test Your Car's Cylinder Oil - - - 113

HOW-TO-BUILD FEATURES

Tiny Amplifier Features Metal Tubes - - 90
Extend Holiday Greetings With Outdoor Decorations - - - - - - - - - - - 94
"Jumping Jeff"—A Tiny Tot's Toy - - - 97
Tiny Hand Power Grinders Simplify Model Carving - - - - - - - - - - - - 98
Build Thriller Toboggan Slide - - - - 100
A Christmas Circus For Kiddies - - - - 101
Completing The Model Mayflower - - - 102
Generator Makes Gas For Cooking - - - 108
Spin Metal Projects On A Lathe - - - - 110

INTERESTING SCIENTIFIC ITEMS

Pilot Uses Inflated Suit On Record Altitude Hop - - - - - - - - - - - - - 47
Lone Girl Raises 15,000 Chickens In Indoor Cages - - - - - - - - - - - - - 63
Television Phone Links Two German Cities 67
Electrical Stethoscope Helps Doctors Diagnose 73
Iodine Vapor Pipe Detects Fingerprints - 79
Bureau Of Mines Opens First Hydrogenation Plant - - - - - - - - - - - - - 85
Explorers Use Amphibian Plane - - - - 85
Grandfather Wins Air Race - - - - - 88

NEW MECHANICAL INVENTIONS

Huge Machine Builds Road In Single Operation - - - - - - - - - - - - - - 40
Typewriter Has 2,000 Keys - - - - - 40
College Has Study Enforcer Machine - - 40
Air Commerce Bureau Adopts Radio Typewriters - - - - - - - - - - - - - 41
Blind Man Remodels Home - - - - - 41
Newsboys Wear Neon Signs - - - - - 41
Pullman Cars Go Modernistic - - - - - 47
Saddle Clamp Is Removable - - - - - 47
Auto-Yacht Features Aluminum Hull Construction - - - - - - - - - - - - - 49
Blow Torch Thaws Switch - - - - - 49
Machine Aids Beet Farmers - - - - - 49
Russian Invents Double Recording Discs - 54
Bus Ads Shown On Screen - - - - - 54
House Shaped Like Elephant - - - - - 63
Locomotive Pulls 100 Cars - - - - - - 63
Ladder Aids Fire Laddie - - - - - - 67
Fastest Transport Plane - - - - - - - 67
Device May Stop R. R. Crashes - - - - 73

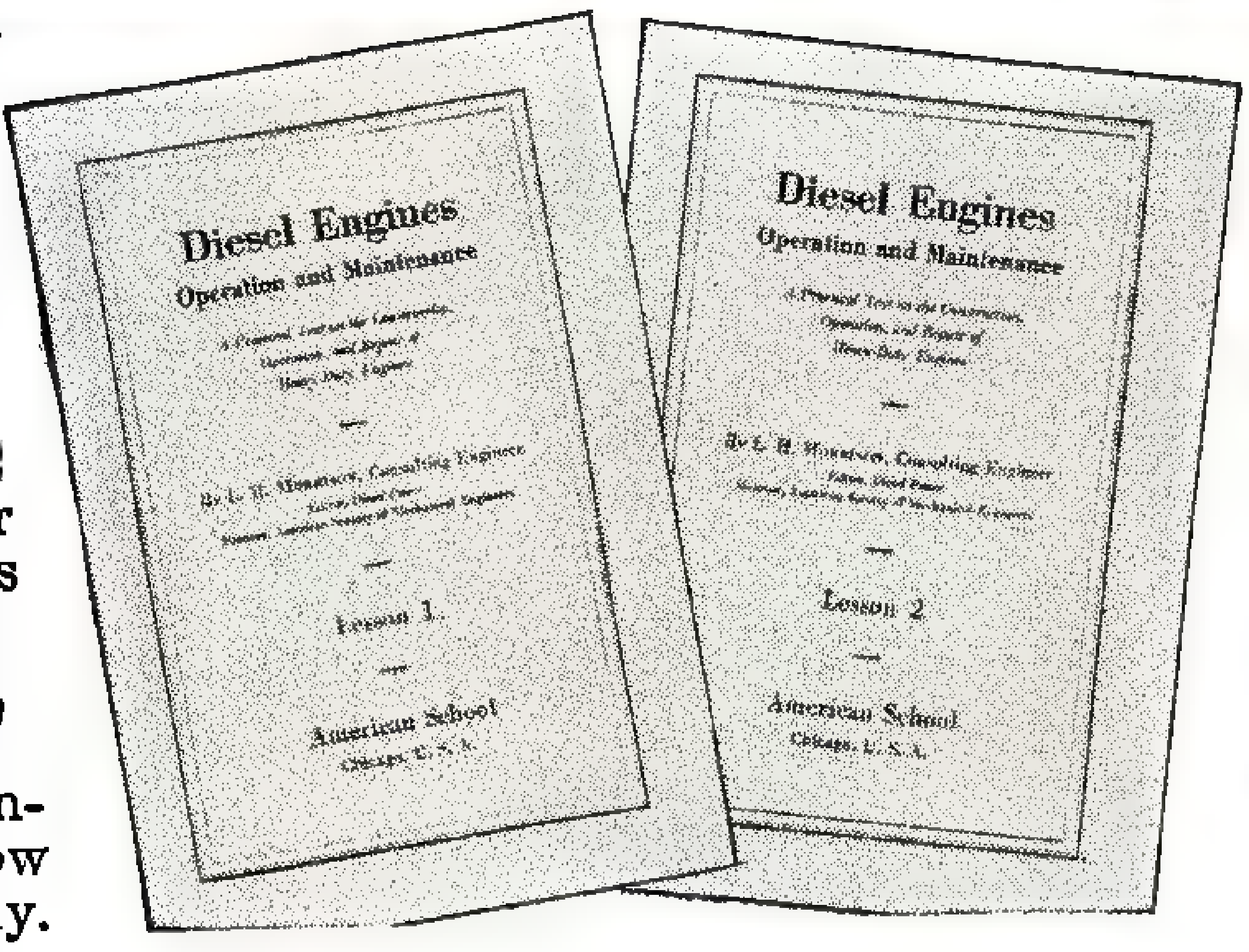
[*Continued on page* 14]

2 Beginning Lessons in Diesel Engineering Free

Test Yourself Without Cost

See how readily you, too, can

Learn Diesel



Diesel Engines
Operation and Maintenance
Lesson 1.
American School
Chicago, U. S. A.

Diesel Engines
Operation and Maintenance
Lesson 2
American School
Chicago, U. S. A.

At your leisure in your own home, read these 2 Diesel lessons carefully. Judge for yourself our ability to teach—and your ability to learn—this fast-growing new line of work.

No Previous Experience Necessary

See for yourself how *practical* American School training is—how clearly every fact is presented—how *thoroughly* you can master Diesel through home study.

Diesel—the New, Fast-Growing Power

Is Your Job Safe?

Just as the gasoline engine changed or wiped out the jobs of thousands who depended on horse-drawn vehicles for their living—just as electricity changed the entire set-up in the fields of light and power—so now the Diesel engine is fast invading both the power and transportation fields, and threatening the present jobs of thousands of workers.

If jobs in your line are steadily growing scarcer, you owe it to yourself to investigate this new, progressive, uncrowded line, that in our opinion will offer good openings for the next 25 years.

Diesel engines—because of their high efficiency, dependability, and economy of operation—are fast replacing steam and gasoline engines in power plants, motor trucks and busses, locomotives and ships, aircraft, dredges, drills, pumps, etc.—opening up an increasing number of well-paid jobs for Diesel-trained men. The field of Diesel Engineering is on the upgrade and continually expanding. It will provide steady employment, advancement and good pay for those properly trained in this new industry.

What This New Field Offers You

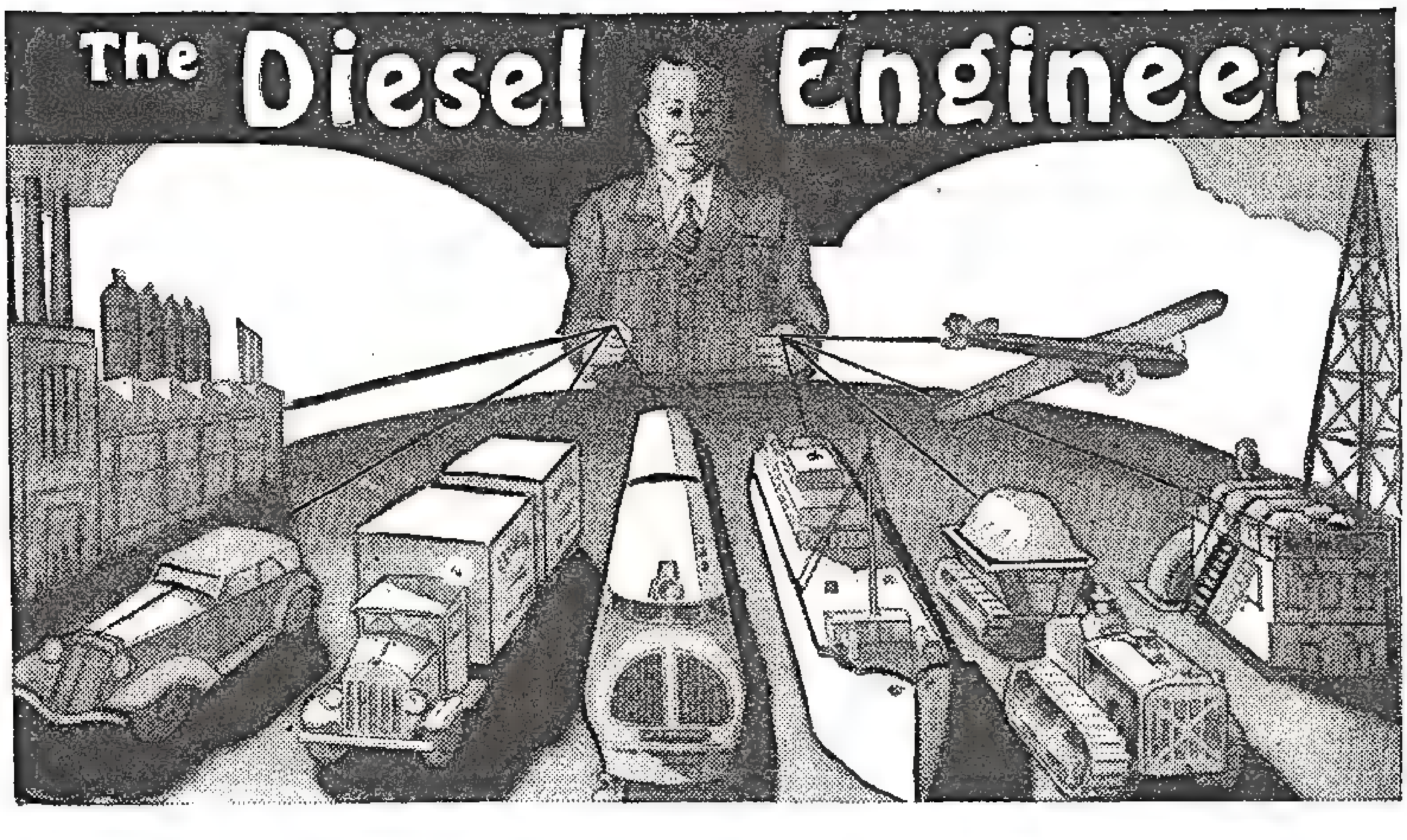
Now is your chance to get into a big new industry and grow up with it to an important position. Today there is practically no competition in the Diesel field, but the increasing use of Diesel engines will result in keen competition for jobs in the near future. By starting your training now, you can keep ahead of such competition.

You get complete information on all the latest Diesel developments—two- and four-stroke cycles; low- and high-speed and heavy duty types; Diesel-electric generating systems, etc.—in our course. Includes all text material—with special diagrams for quick understanding of this new power.

Real Opportunities for Trained Men

Get our Free Diesel Booklet and learn all about this new, fast-growing line—its opportunities and requirements. Find out what the Diesel field offers you—how rapidly the Diesel industry has developed during the last three years—the large number of Diesel engines and accessories being manufactured today—how quickly you can obtain a complete understanding of Diesel engine principles and operation by home study during your spare time! . . . at your own pace—without interfering with your regular work.

American School, Dept. D-128, Drexel Avenue at 58th Street, Chicago



Get These 2 Diesel Lessons

When you learn what worthwhile opportunities Diesel offers and how readily you can cash in on them through American School training, it may mark the turning point in your life. Asking for full information involves NO obligation—so write TODAY for FREE lessons and FULL information.

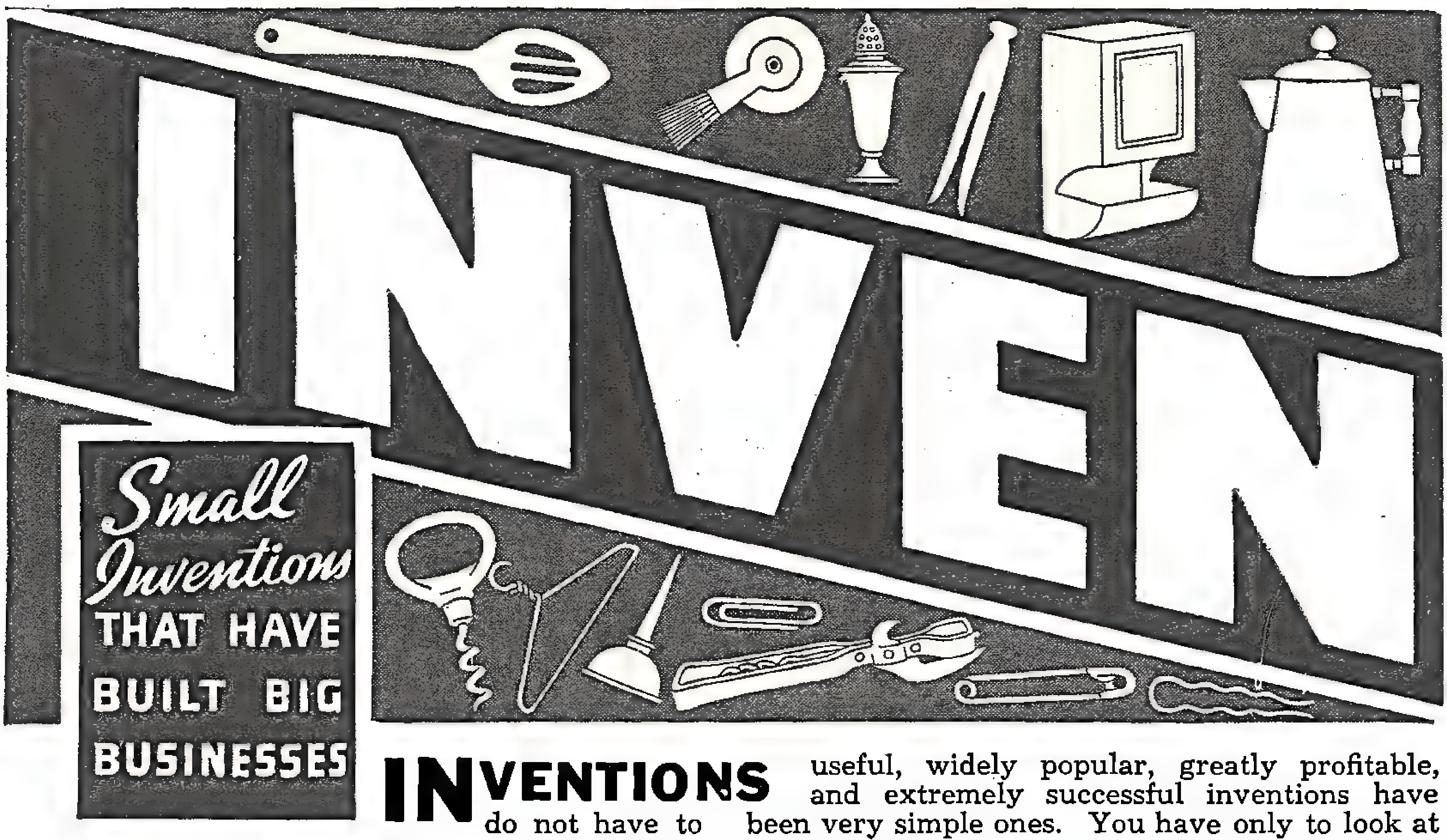
Free Lesson Coupon

American School, Dept. D-128
Drexel Ave. at 58th St., Chicago

WITHOUT obligation, please send me 2 beginning lessons in Diesel Engineering FREE. They are to be mine, to keep. Also send FREE Diesel booklet.

Name...

Address...



INVENTIONS do not have to be complicated to be profitable when Patented. The 5c and 10c stores flourish on simple Patented products which are commercially successful. The zipper, safety pin, thumb tack, paper clip, collar button—all simple, yet familiar inventions—brought their inventors rich rewards. If you have a Patentable invention—act to protect it. Many of the most useful, widely popular, greatly profitable, and extremely successful inventions have been very simple ones. You have only to look at the devices we have pictured here to realize how a simple invention may become a utility bought by a hundred thousand or a million people soon after it is produced. Don't be afraid that the simplicity of your invention makes it valueless. The thing that you find so simple that you wonder why a thousand other people haven't already done it is often the invention worthwhile.

HOW OTHER INVENTORS GOT STARTED

INVENTOR AND BUSINESS MAN

The list of men who succeeded in invention with only a poor boy's start is a very long and noble one. Poverty, hardships, lack of friends, distance from the market—these could not hold back Bell, Edison, Eastman, McCormick, Whitney and others. Everyone cannot succeed. But every man can try. Courage, sacrifice, and hard work may bring you a measure of the success these men had. Lack of mechanical ability is not a serious draw-back. You can always get someone able to build a model, draw a detailed design, or otherwise materialize your invention for you. The big draw-back is discouragement.

Your invention of a practical article or an improvement upon an old one should be patented NOW. Frequently many of the thousands of applications filed in the U. S. Patent Office each year are for the same or almost the same invention. In such a case, the burden of proof rests with the last application filed. Sometimes a delay of even a few days in filing the application means the total loss of the patent. LOSE NO TIME.

The entire time of this large and experienced organization is devoted exclusively to patent and trade-mark cases. We know the rules and requirements of the Patent Office. We understand the technicalities of Patent Law. We can proceed in the quickest and safest ways in preparing an application for a patent covering your invention.

FREE THE BIOGRAPHY OF GEORGE EASTMAN

Views of the man who used Patent Protection to amass millions and give perfection to a new art—*Photography*—itself one of the greatest inventions.

CLARENCE A. O'BRIEN & HYMAN BERMAN

317-S ADAMS BUILDING **WASHINGTON, D. C.**

Registered Patent Attorneys Before U. S. Patent Office

Send For This FREE BOOK

PATENT GUIDE
FOR THE INVENTOR
CLARENCE A. O'BRIEN
REGISTERED PATENT ATTORNEY
WASHINGTON D.C.

TORS

PROTECT YOUR INVENTIONS WITH U.S. PATENTS

If you have an invention that is patentable—and want to secure for yourself your inventor's sole right to profit from the invention—you can't afford to lose time in securing the protection of a U. S. Patent. Other inventors may be working on the same invention right now. Should they develop this invention and file patent application before you do—the burden of establishing priority will be upon you. Our Big Book—"Patent Guide for the Inventor"—will tell you the quickest possible way to secure Patent Protection for your invention. SEND FOR IT TODAY!

The First Important Step in Securing a Patent

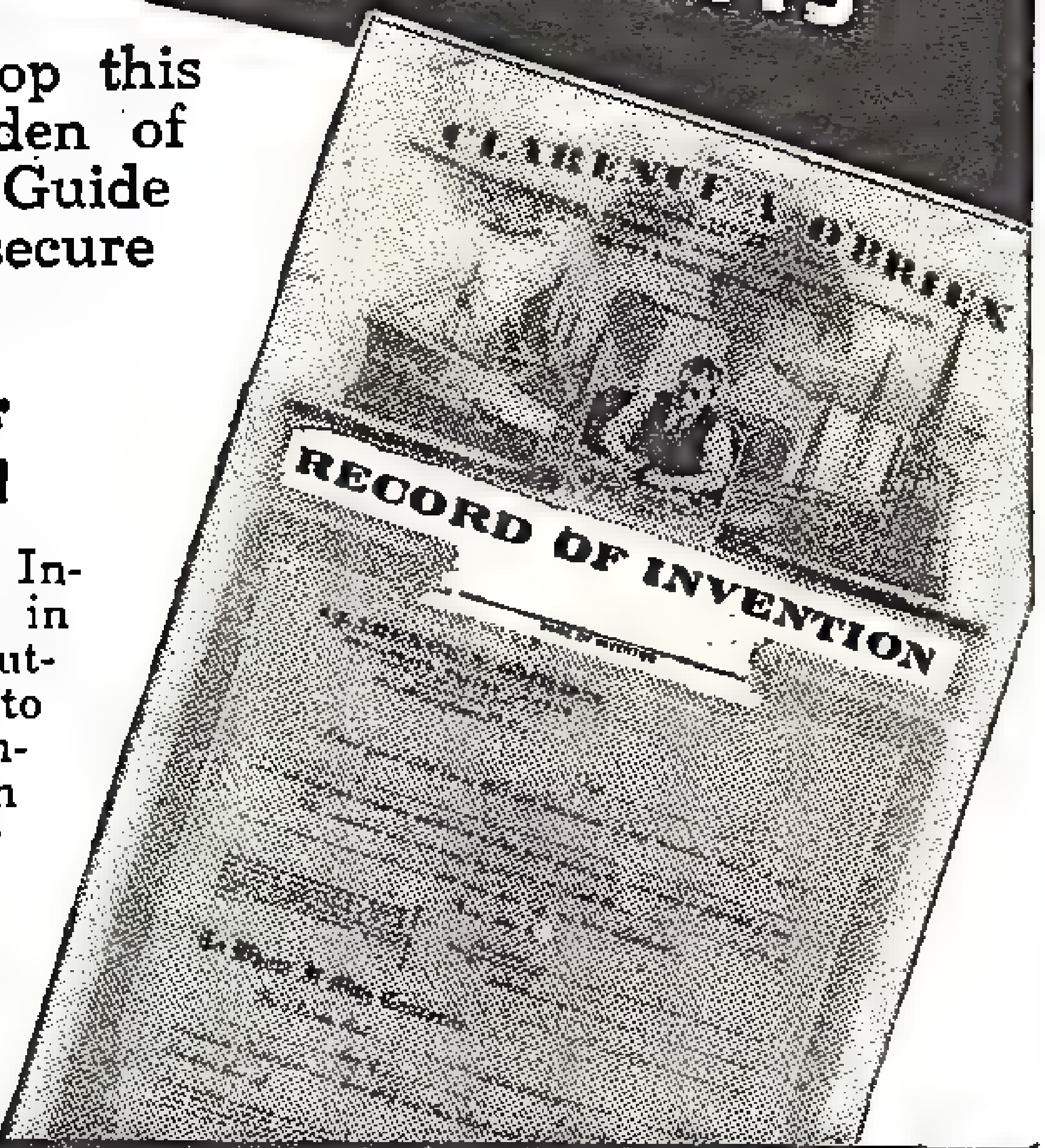
is to obtain the services of a Registered Patent Attorney. The U. S. Patent Office advises that you secure the aid of an experienced Registered Patent Attorney to prepare your statements. Establish the date of your invention as explained in our book and disclose your invention to him in correct form. He then makes a SEARCH of the Patent Office Records and reports to you on existing U. S. Patents which might bear on your invention, giving his opinion on the advisability of proceeding and filing formal application.

Reasonable Fees—Convenient Terms

Don't worry about finances. Our fees are very reasonable—we can arrange convenient terms of payment. It is our custom to permit clients to pay for our services in installments as the application progresses in our office. See our Big Book for fees in obtaining Patent. It explains our arrangements clearly. Send for it NOW!

FREE RECORD OF INVENTION FORM

Use our Free "Record of Invention" form to assist you in recording the descriptive outline of your inventions and to establish the date of your invention. With it you can make a rough sketch of your invention and have it witnessed in a manner of value to you as evidence should occasion arise.



CLARENCE A. O'BRIEN
& HYMAN BERMAN
317-S ADAMS BUILDING
WASHINGTON, D.C.
REGISTERED PATENT ATTORNEYS
BEFORE U.S. PATENT OFFICE

Please send me at once your Big Free 48-Page Book, "Patent Guide for the Inventor" and your Specially Prepared "Record of Invention" form. Also George Eastman Biography, "Inventor and Business Man." This request does not obligate me.

NAME ....

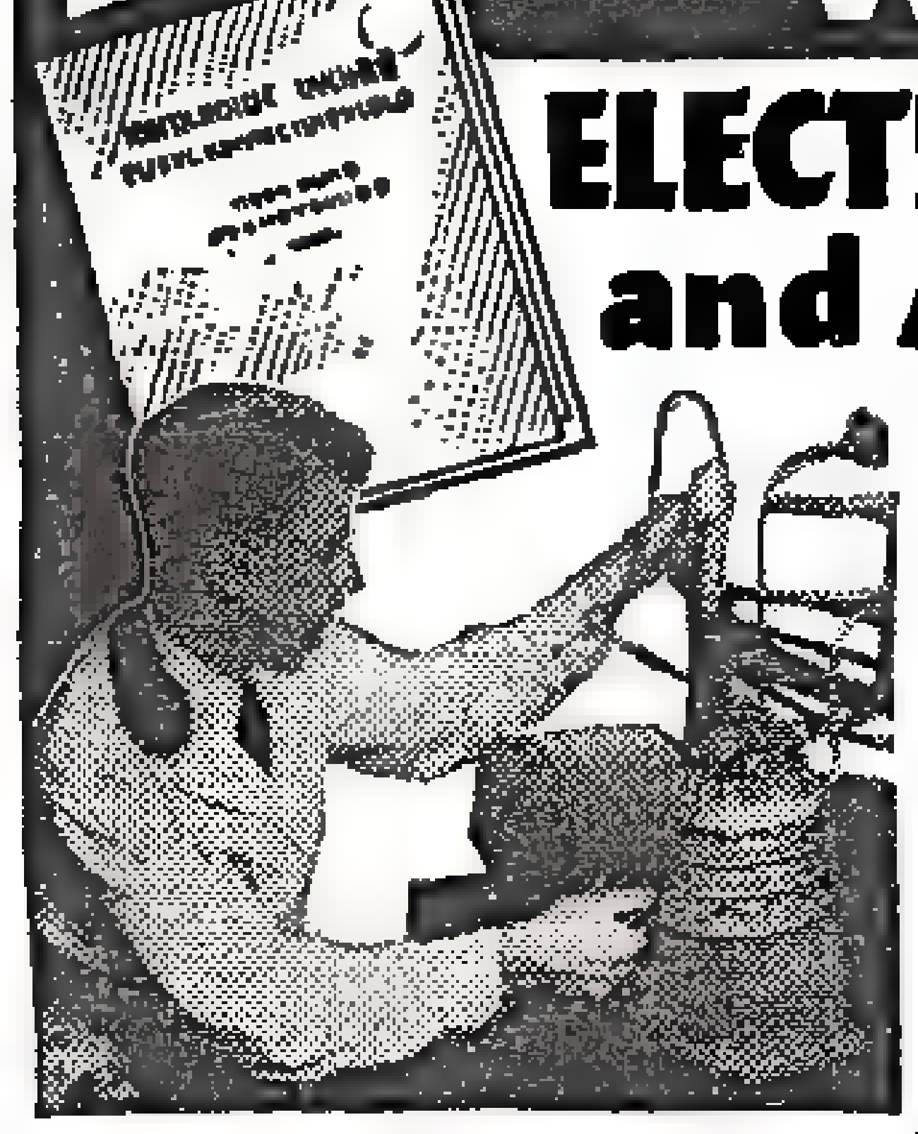
ADDRESS ....

....

(*Please write or print plainly*)

FREE BOOK Tells How to Earn UP TO $30-$50 and more WEEKLY

ELECTRIC REFRIGERATION and AIR CONDITIONING



Think, Man! Two new rapidly growing industries offer the very opportunity you are looking for. Big Pay, Fascinating Work—a bright Future. Where would you be today if you had been able to cash in on one of the opportunities offered by the Radio and Automobile Industries when they were new? Think how men's salaries soared—how "beginners" were skyrocketed into permanent prosperity.

MEN NEEDED NOW

RIGHT NOW there are new jobs for thousands in Electric Refrigeration and Air Conditioning. Prepare for your opportunity at home in spare time by U. E. I.'s low-cost, easy-pay plan. Learn Engineering, Estimating, Installation and Servicing under a system that has brought outstanding results for TEN YEARS. Get practical experience in one of our large, completely equipped Laboratories, where you'll learn by doing.

LET US HELP YOU PREPARE FOR A BIG PAY JOB

U. E. I. trained men are now employed by leading manufacturers, distributors and service organizations. U. E. I. Employment Service offered FREE of extra cost. What it has done for others it can do for you. Mail Coupon for Book of Facts about your opportunity.

U. E. I. TRAINING Helps Men Get Jobs

"Got job with Mr. H., one of the men to whom you wrote letters . . . signing up to take your course was one of the wisest things I ever did." L. E. C., Calif.

"Called on Mr. W. of the Ideal Refrigeration Company and the fact I had training with U. E. I. got me job, Mr. W. is a U. E. I. graduate." W. F. L., Mich.

"Secured employment with C. & S., one of firms to which you referred me . . . taking full charge of Service Departments." R. R. W., Ill.

"Am now employed by Frigidaire in charge of assembly of self-contained room coolers . . . would never have made it without your training." J. S. S., Ohio.

UTILITIES ENGINEERING INSTITUTE
Established 1927
400-410 N. Wells St., Dept. 217, Chicago, Ill.

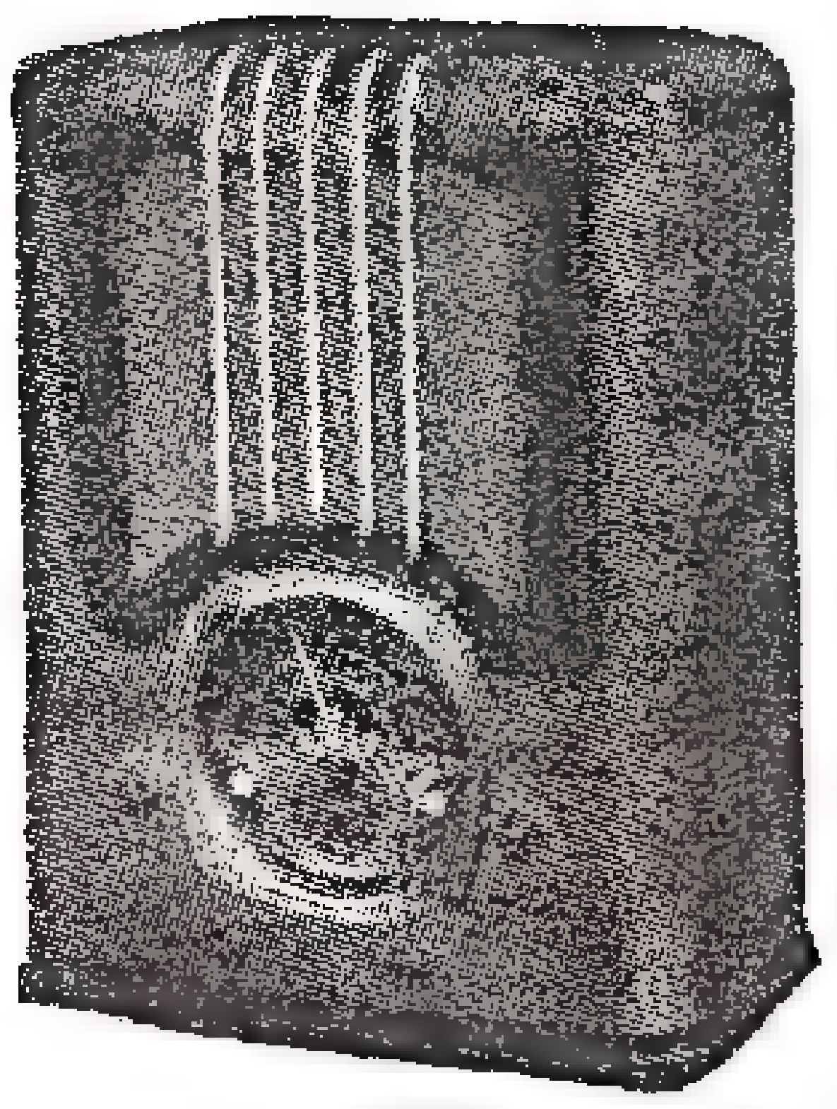
UTILITIES ENGINEERING INSTITUTE, Dept. 217
400-410 N. Wells St., Chicago, Ill.
Please send me your Free Book telling about MY opportunity in Air Conditioning and Electric Refrigeration. I have marked the one that interests me most.
☐ Air Conditioning ☐ Electric Refrigeration
NAME ______________________
ADDRESS ______________________
CITY ______________________ STATE ________

Explore the World on Air Waves with the NEW 1937 Radios by

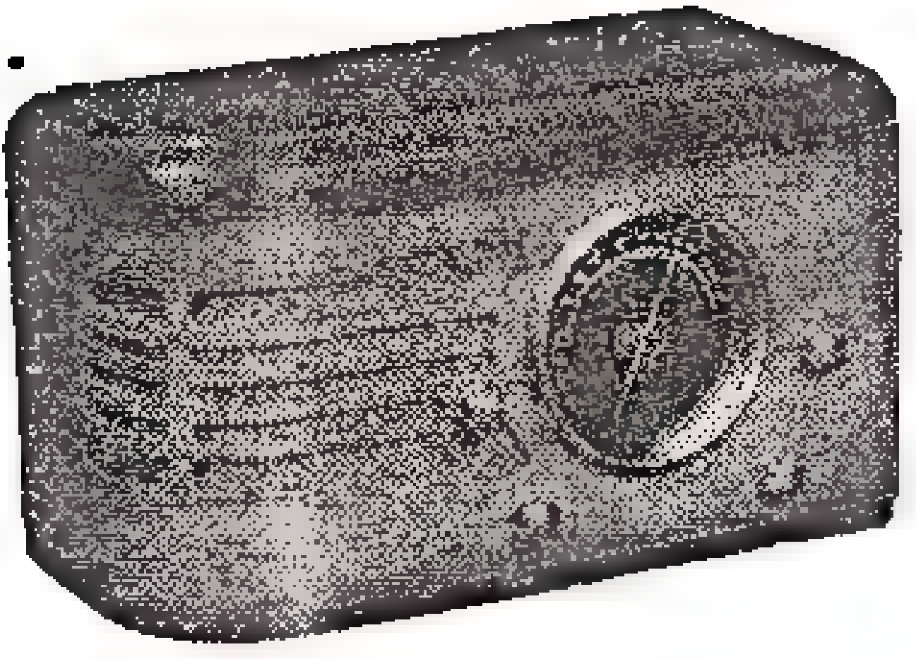
HAMILTON

Long and Short Wave
Foreign and Local Broadcast
Police Calls—Code
Airplanes—Amateurs

$14.50 up **5 to 11 tubes Superheterodyne 16.7 to 2140 meters**



Send for new catalog showing 10 latest designs



Marvels of appearance and performance! HAMILTON Radios are designed to compete with sets selling at twice-prices. Latest engineering features. Airplane dials. Wonderful dynamic speakers. Microsharp volume control. Hairline selectivity. Each beautiful walnut cabinet suggests a perfect Christmas gift to some dear one or to yourself!

HAMILTON SPECIALTY COMPANY
135 Lockwood Ave., Dept. M, New Rochelle, N.Y.

CONTENTS—Continued from page 10

Boat Devised From Scraps - - - - - - 73
Huge Pineapple Is Water Tank - - - - 79
Street Cars Run On Trackless Bridge - - 79
Vibrator Tamping Machines Develop Great Power - - - - - - - - - - - - 80
Converter Aids Lathe Work - - - - - 80
Dry Battery Provides Power - - - - - 85
Floating Aerodromes Speed Trans-Ocean Flights - - - - - - - - - - - - 88

FOR THE WORKSHOP FAN

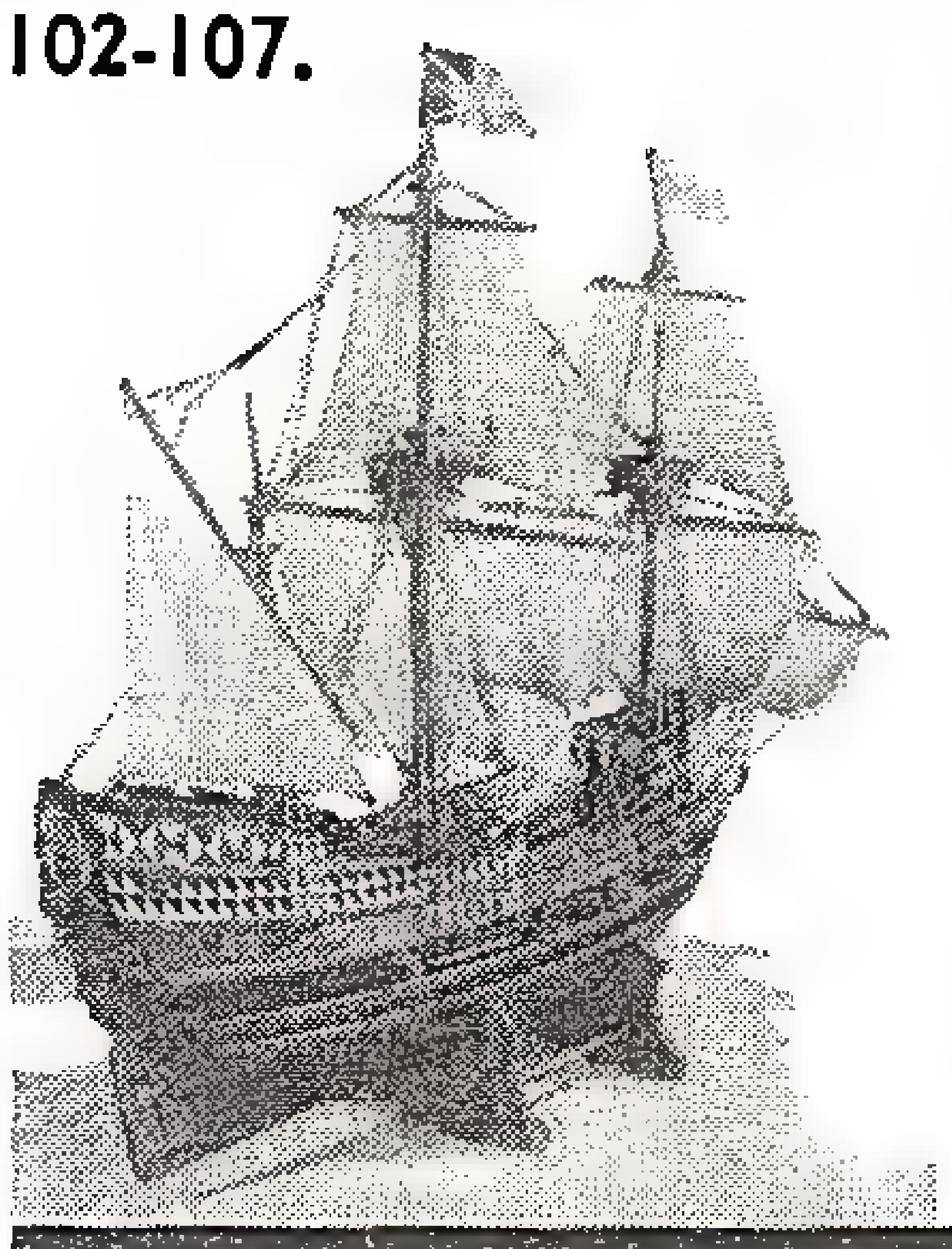
Spool Is Automatic Switch - - - - - 89
Chart Identifies Resistors - - - - - - 89
Polish Bottle Is Handy Torch - - - - - 89
New Ideas For The Radio Fan - - - - - 92
Workshop Hobbies - - - - - - - - - 93
Decorate Woods With "Sugi" Finish - - - 93
Gun Catapults Toy Planes - - - - - - 93
Pipe Fittings Form Modern Desk - - - - 96
Utilizing Home's Odd Corners - - - - - 96
"Mike" Lamp Serves As Radio Decoration - 109
Magnet Opens Secret Lock - - - - - - 109
Tips For Modern Motorists - - - - - 114

DEPARTMENTS

Solving The Readers' Problems - - - - 18
Random Chips From The Editor's Workbench 24
Nic Sprank's Science Oddities - - - - - 34
Radio Sparks And Electrical Experiments - 89
Camera Puzzlers - - - - - - - - - - 116
With The Hobbyists - - - - - - - - - 148
New Business Ideas - - - - - - - - - 154

BUILD THIS BEAUTIFUL MODEL
MAYFLOWER SHIP

THIS authentic looking model of the famous ship MAYFLOWER is an ideal project for the shop man, hobbyist or model fan. The last installment on the construction of this ship appears in this issue of Modern Mechanix Hobbies and Inventions on pages 102-107.

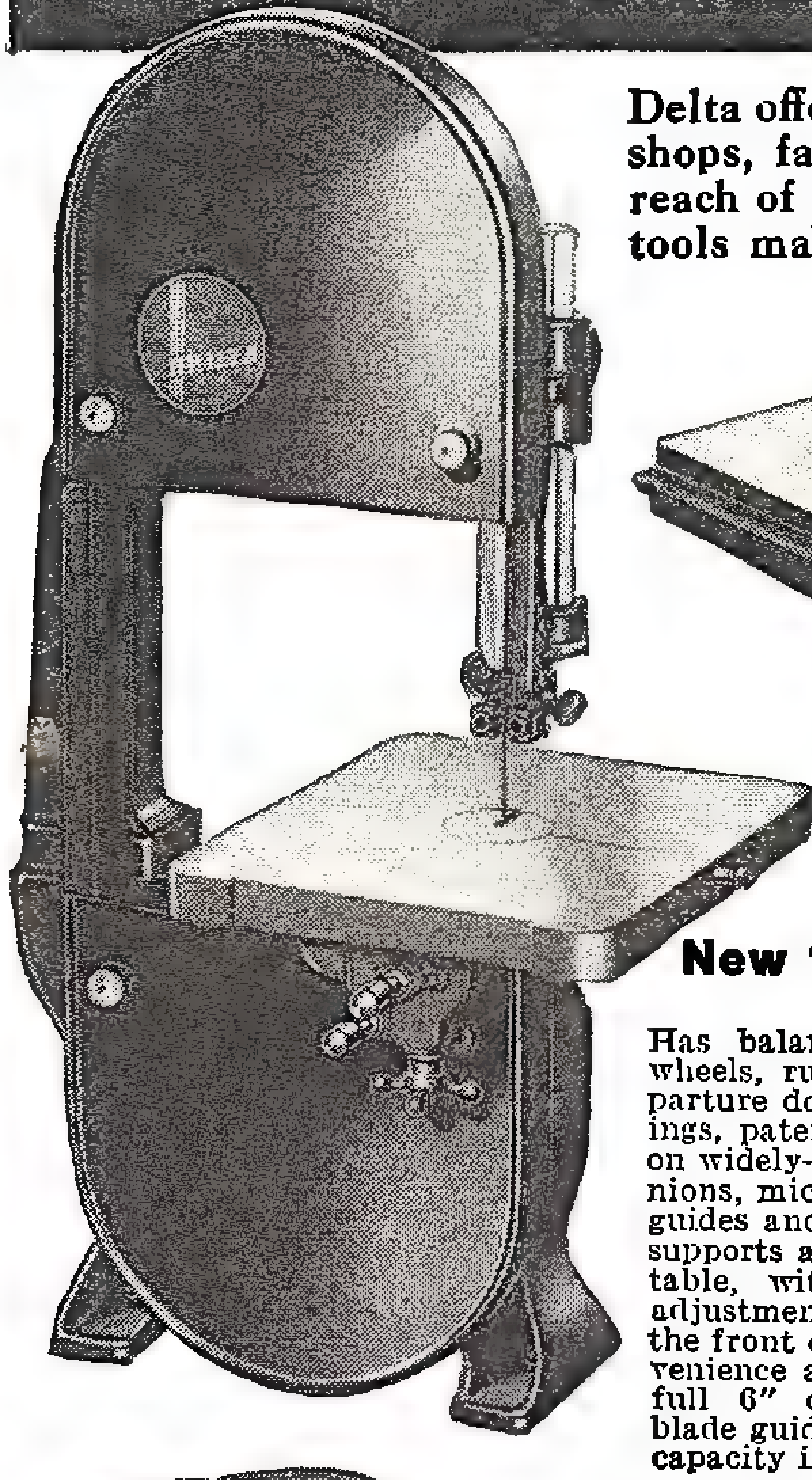


A complete set of full scale blueprints are available for those who wish to build the Mayflower. These plans will be of great assistance to all who plan building this model. The complete set is available, including materials and supply source list at $3.00 postpaid. Send all orders for blueprints to:

MODERN MECHANIX PUB. CO.
Fawcett Building Greenwich, Conn.

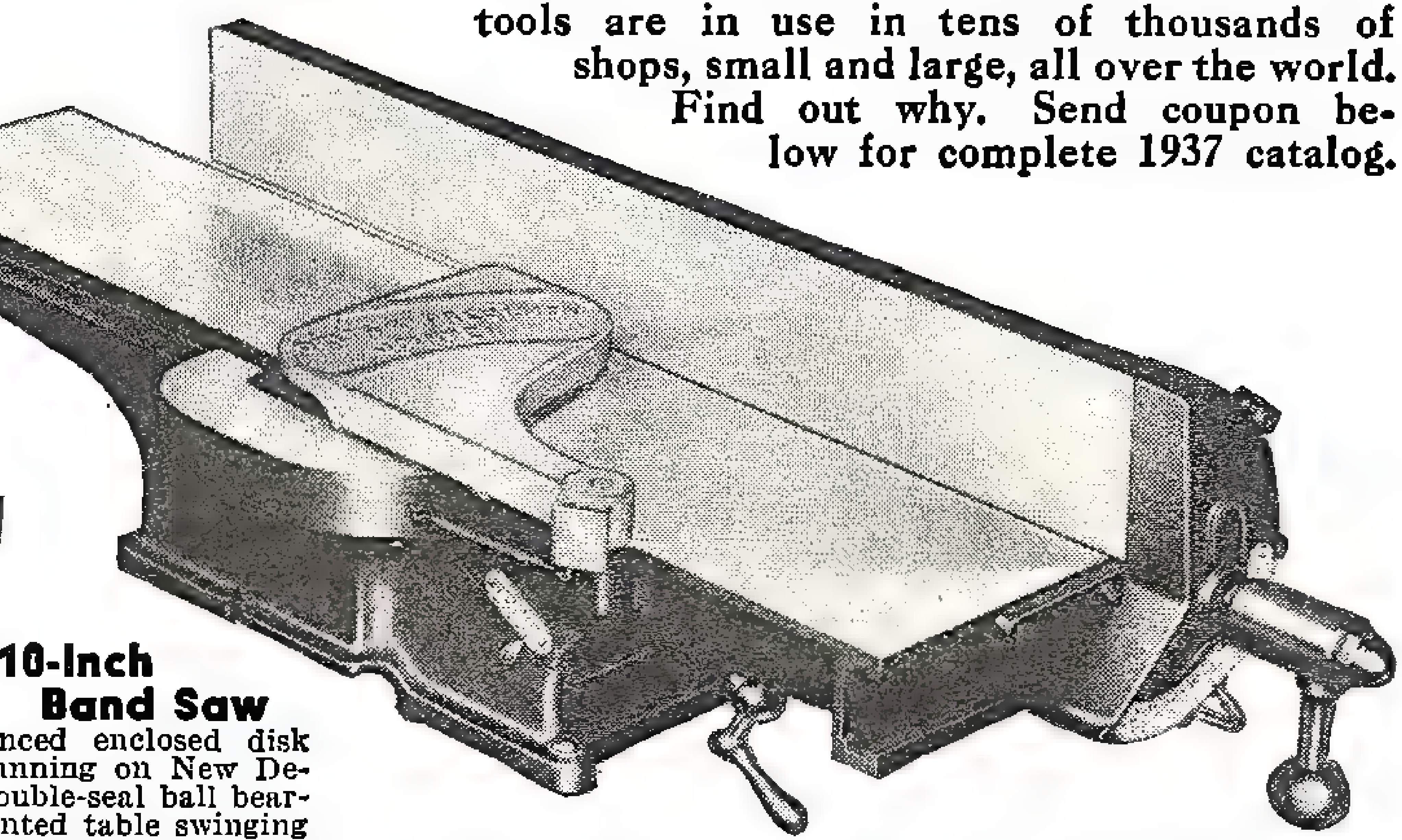
New 1937 DELTA Low-Cost Quality Tools

Delta offers a complete range of motor-driven tools for home work shops, small shops, factories, and builders. Prices are low enough to be well within the reach of the home craftsman. Yet the quality, sturdiness and accuracy of these tools make them ideal for the steady heavy grind of production work. Delta tools are in use in tens of thousands of shops, small and large, all over the world. Find out why. Send coupon below for complete 1937 catalog.



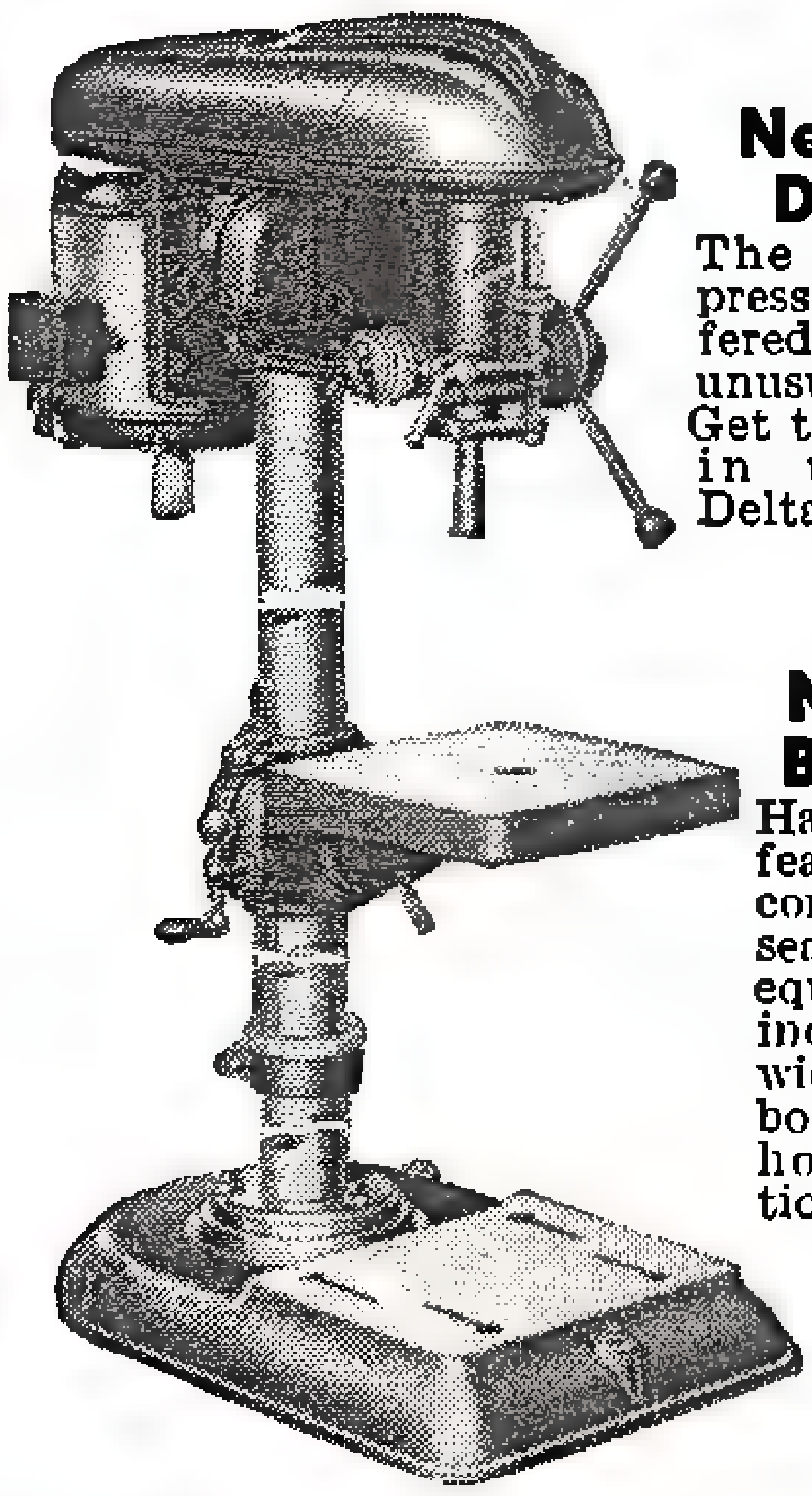
New 10-Inch Band Saw

Has balanced enclosed disk wheels, running on New Departure double-seal ball bearings, patented table swinging on widely-spaced double trunnions, micrometer adjustment guides and ball-bearing blade supports above and below the table, with the lower-guide adjustments brought out to the front of the table for convenience and safety — and a full 6" capacity under the blade guide—where you need capacity in a band saw.



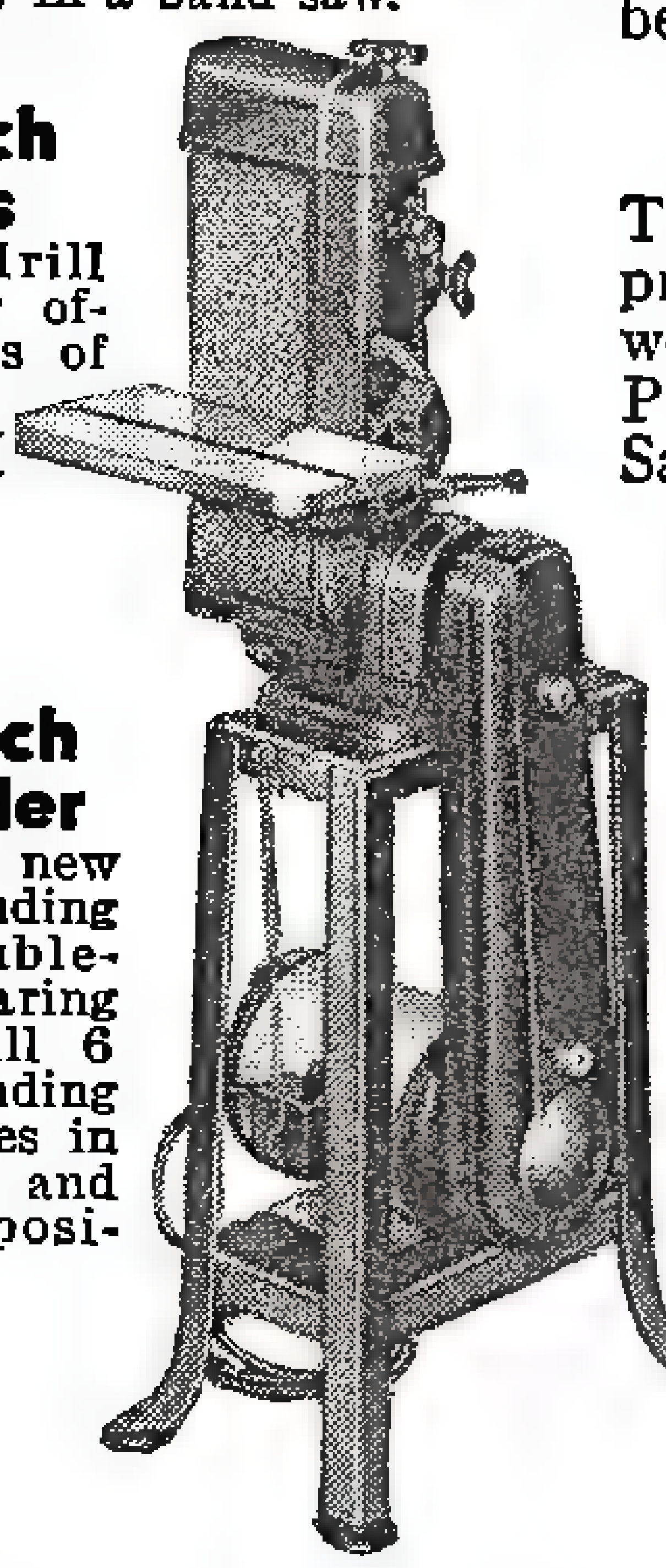
NEW 4-INCH JOINTER

It has the patented fence that insures sure, free action and unvarying accuracy of the settings, patented swinging stop with its individually adjusted stop screws, swinging dual-control handle that makes control of the fence so convenient. Double-seal ball bearings, of course, and dovetailed ways for the tables. The ideal tool for the man who wants the best and who requires only 4-inch capacity.



New 17-Inch Drill Press

The greatest drill press value ever offered. Has scores of unusual features. Get the full story in the 1937 Delta catalog.



New 6-Inch Belt Sander

Has numerous new features including complete double-sealed ball-bearing equipment, full 6 inches of sanding width. Operates in both vertical and horizontal positions.

Many New Tools—New Improvements

The 1937 Delta line incorporates many new tools, new improvements, new accessories—of interest to every man who works with tools. The complete Delta line includes Drill Presses, Circular, Band, Scroll Saws, Lathes, Shapers, Sanders, Grinders and full line of accessories.

Send for 1937 Catalog

It is crowded with interesting illustrations and descriptions of the complete Delta line. Points out in detail the important features of Delta design. And also the new 32-page book No. 3 of "Practical Delta Projects" crowded with new and "out of the ordinary" things to make—with many photographs, working drawings, and easy-to-understand illustrations. Simple, complete instructions make every project easy to follow. Every woodworker should have this book. Send 10c with coupon for Delta Project Book No. 3, 1937 Delta catalog mailed postpaid.

DELTA MANUFACTURING CO. Dept. M137
600-634 E. Vienna Ave., Milwaukee, Wis.

I enclose 10c (stamps or coin) for which please send me one copy of the new 1937 Book No. 3 of "Practical Delta Projects." Also place me on your mailing list to receive 1937 Delta catalog of quality motor-driven tools. I am interested in Delta Tools for:

Home Shop ☐ Industrial Use ☐ School Shop ☐

Name.. Age...............

Address ....

City.................................... State........................

( ) Check here if you are a Delta user now.

DELTA MFG. CO.

600-634 E. Vienna Ave., Milwaukee, Wis.

IMPORTANT: Outside of the United States and its possessions, Delta Tools are known as "TAUCO" Tools. Tauco tools are identical in every respect to Delta Tools.

MESSY GLUE POTS THING OF THE PAST

Men who know their wood-working ... experienced craftsmen ... have discovered that mixing glue in messy old-fashioned glue pots is a waste of time. The modern way, the *sensible* way is to buy LePage's Liquid "all purpose" Glue in handy cans. LePage's guarantees lasting strength. LePage's joints practically "weld" the wood. Ideal for veneering and inlaying. Makes snug joints, reinforces nails and screws, fills small cracks and nail holes. Use LePage's—and the job is permanent. All hardware and drug stores sell LePage's Liquid Glue in the tube, bottle or can. There is no need for any homecraftsman to be without it. LePage's Adhesives, Laboratories and Factory, Gloucester, Massachusetts.

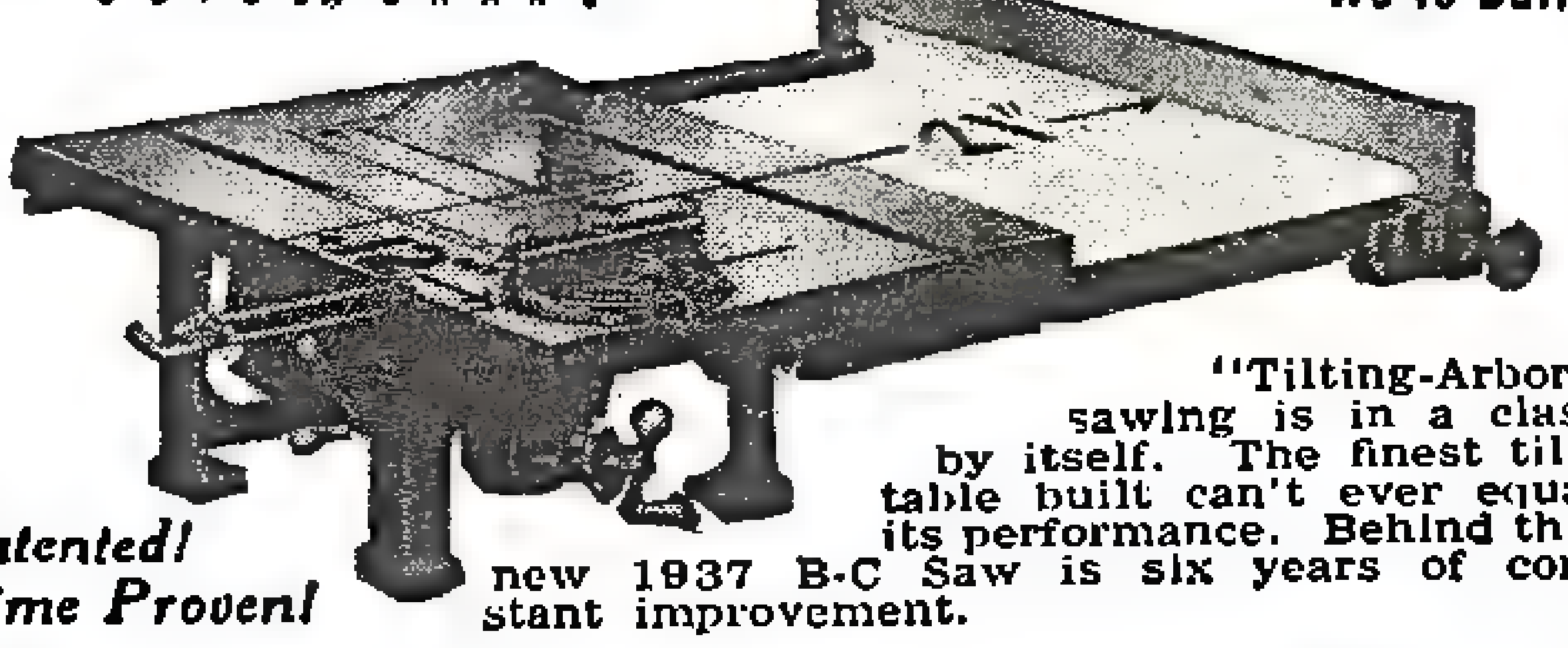
LEPAGE'S GLUE
LEPAGE'S
strength
LIQUID GLUE

BOICE-CRANE TOOLS FOR 1937

—described in BIG, NEW Catalog!

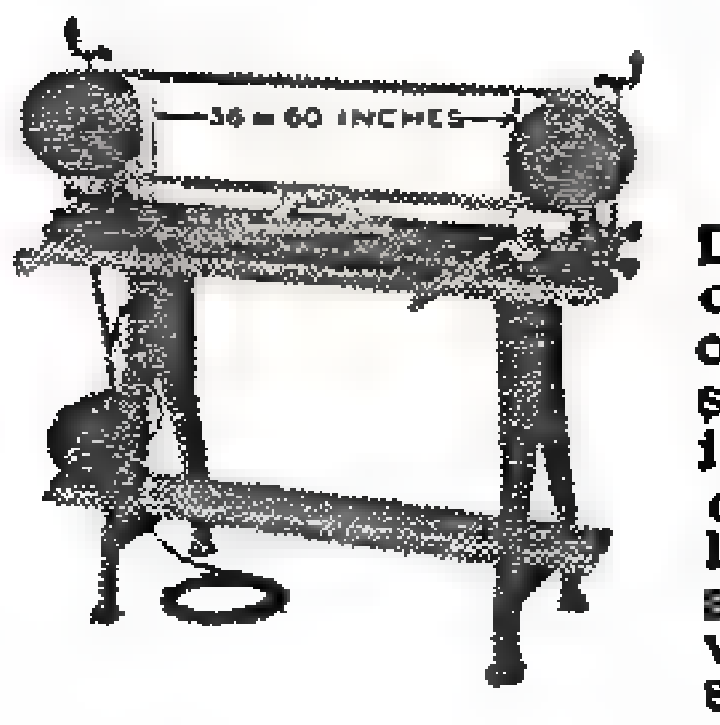
New TILTING ARBOR BOICE-CRANE Saw

The Finest Saw We've Built



"Tilting-Arbor" sawing is in a class by itself. The finest tilt-table built can't ever equal its performance. Behind this new 1937 B-C Saw is six years of constant improvement.

Patented! Time Proven!



NEW! NEW!

All-Purpose Belt Sander

Don't make the mistake of wasting hard earned $$ on small impractical sanders. Buy this new improved B-C that handles all lengths and widths of stock.

Only $9.00

Practical Wet Tool Grinder

Few $$ buys it. Extra life from hand tools pays for it. Uses time-proved wet wheel.

Get Your Copy of This Big FREE Catalog Now!

BOICE-CRANE Co., Dept. MX. 1-M, Toledo, Ohio

SAWS - JOINTERS - LATHES - DRILLS - SHAPERS - SANDERS - JIG-BAND SAWS

EVERY TOM, DICK and HARRY WILL BE WORKING for YOU!

WHATTA LIFE—you have the gas station attendants, the waitresses, garage men, laborers, railroad men, as a matter of fact, every Tom, Dick & Harry telling your story and everybody's interested. It's really fun! And do you collect profits!!—we mean *Big Money!* Your helpers are well paid too—but not by you—we take care of that. *Better write for this interesting big money plan today—right now so you will be first.*

GARDEN CITY NOVELTY CO.

4386-C Ravenswood Ave. Chicago Ill.

Build YOUR OWN Wind Driven Light Plant

FREE Lights

from old auto generator. We show you how. Make money building for others. Light your buildings, play radio, operate washing machine and other motors. Dime brings complete plans and 1937 catalog. Over 50 other changes for 6-12-32 and 110 volt plants. Satisfaction guaranteed. Write today.

LEJAY MANUFACTURING CO.

1414 W. Lake Street Minneapolis, Minn.

RAISE RABBITS FOR US

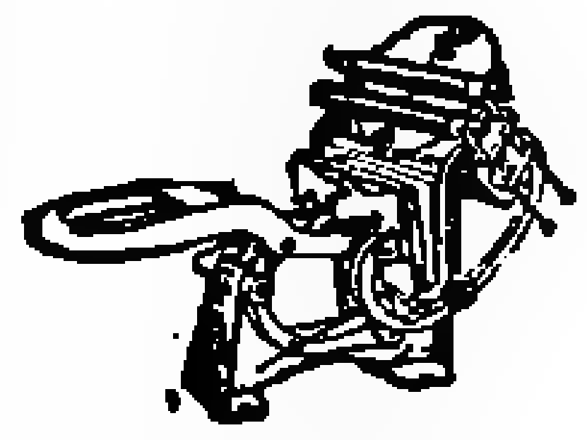
We Pay You Up To $5.00 Each.

Also Put You in Touch with MARKETS EVERYWHERE. Large illustrated book and catalog, also copy of the **AMERICAN RABBIT FARMER** and monthly market bulletin showing names of buyers in various parts of America who continuously buy all rabbits offered them. All for 10 cents.

OUTDOOR ENTERPRISE CO., 113 Main St., New City, N. Y.

MAKE MONEY PRINTING

letter and billheads, circulars, cards, for friends, spare time. Easy to learn. Easy to get jobs. Printing Presses, $12; new type, complete supplies, lowest prices. Send stamp for catalog.



PEIFFER CO., 95-A 6 Columbia St., Newark, N. J.

HAVE YOU A RADIO IN YOUR CAR?

Did you know that the *Radio Builders' Manual* describes a fine 6-tube auto set? Why not get a copy and build your own? Send 50c today to

MODERN MECHANIX PUBLISHING CO.
GREENWICH, CONN.

$ell *Improved* Leather Ties!

DON'T waste effort on second raters. Sell fast and repeat on handsomest **Improved** ties. Rich colors, embossed like silk. Fullest cut; long wear; wrinkle-free. Wipe clean like new with damp cloth. Send **50c** for sample tie (65c value) and **Big Free Sales Kit** of new season's smartest patterns. Money back plan. Free premiums.

NU-MODE TIE CO., Dept. 50
1333 N. 12th Street Milwaukee, Wis.

Learn Advertising at Home

Make money in advertising. Prepare quickly during spare time. Also earn while you learn. No experience necessary. New, easy method. Nothing else like it. Send at once for free booklet—"Win Success in Advertising", and full particulars. No obligation.

Page-Davis School of Advertising
3601 Michigan Avenue, Dept. 2051, Chicago, Illinois, U. S. A.

BE A RADIO EXPERT

LEARN at HOME *from* REAL RADIO ENGINEERS

RAY D. SMITH, Pres. R-T-I

Let these Engineers, RIGHT FROM THE HEART OF THE GREAT RADIO INDUSTRY TRAIN YOU IN SPARE TIME FOR A *Good Pay Job!*

HERE THEY ARE:

Kendall Clough
Chief Engineer,
Clough-Brengle Co.

E. E. Gramer
Chief Engineer,
Standard
Transformer
Corporation.

Karl E. Hassel
Chief Engineer,
Zenith Radio
Corporation.

F. H. Schnell
Radio Engineer,
General Household
Utilities (Grunow).

Dr. C. M. Blackburn
Asst. Factory Manager
P. R. Malloy & Company
Mfrs. of Radio Apparatus

F. L. Howard
Chief Engineer,
Radio and Television
Institute.

If you're dissatisfied with small pay—lay-offs and an uncertain future—here's an opportunity that's too good to miss. At the cost of only the time it takes you to mail the coupon, you can get my big FREE book, "RADIO'S FUTURE AND YOUR OPPORTUNITY." This book tells how you can learn at home under the supervision of factory engineers, to make more money almost at once in Radio—whether you want to make Radio your life's work, or use it to pick up an extra $5 to $20 a week in your spare time.

TRAIN NOW FOR GOOD PAY FULL-TIME AND SPARE-TIME JOBS THAT PAY UP TO $75 A WEEK (and more)

Radio is still forging ahead. 1936 beats all other years. Over 6 million new sets sold. Over 30 million dollars paid for service alone in 1935. Where only a few hundred men were employed a short time ago, thousands are employed today. And where a hundred jobs paid up to $75 a week—there are thousands of such jobs today—many paying even more. And new jobs are being created all the time—**full time jobs and spare time jobs.** Get my book and see how easy it is to learn at home for this good-pay work.

"Shop Training" for the Home

R-T-I Training is different than any training you ever heard about. It comes to you right from the heart of the Radio Industry—right out of the factories where Radio sets and other vacuum-tube devices are made. It was planned and prepared and is supervised by big radio engineers IN these factories—by men appointed for the purpose. This means that trained the R-T-I way, you'll be trained as the Radio Industry wants you trained—just as the Radio Industry, itself, would train you if it was doing the job.

Television, Photo Electric Cells, Public Address Systems Included

Radio service work is only the starting point in R-T-I Training. From there it will take you through the whole field of Radio and Electronics. You will learn about every new development, including Television, so you'll be ready when Television breaks. You'll also learn the big money subjects such as Aviation and Auto Radio; Public Address Systems; how to handle Photo Cells; Sound Picture Recording, Etc.

4 Working Outfits Furnished

Start almost at once doing part time radio work. I furnish 4 outfits of apparatus that you build into test equipment with which you can do actual jobs and earn extra money. My Training pays its own way and you get your money back if not satisfied.

Age or Lack of Experience No Handicap

You don't have to be a high school graduate, nor even have finished the grades. My Training is so simple, easy, and practical, that the average man, regardless of age, education, or previous experience can master it. It offers the chance you have wanted to get out of a small-pay, no-future job, into good pay work with a future, in Radio and all its branches.

Get My Big New Free Book

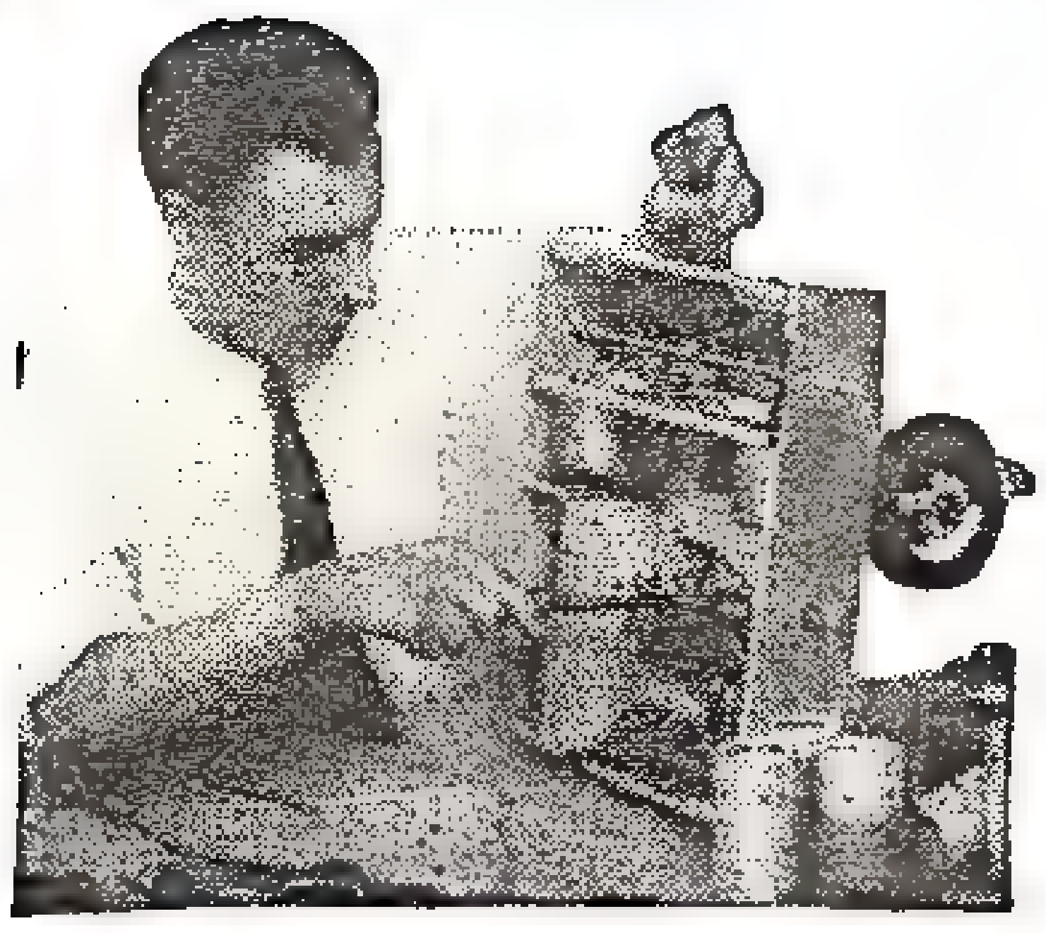
INVESTIGATE! Learn why R-T-I Training is different. Find out why R-T-I Trained men get "Quick Results" and "Big Results." Send for your copy of "Radio's Future and Your Opportunity" today. It tells you about Radio's amazing opportunities. It describes my approved training. It tells what R-T-I students are doing and making. It gives the history of my Advisory Board and 50 endorsing manufacturers. It's FREE. Clip, sign and mail coupon RIGHT NOW!

RAY D. SMITH, President

RADIO AND TELEVISION INSTITUTE

Dept. 31 ● 2130 Lawrence Ave. ● CHICAGO

HAS MADE $250 IN RADIO IN ONE WEEK



Wm. T. Ridd, Verdun, P. Q., Canada, formerly an $18 a week car washer, averages more than $75 a week as an R-T-I Trained man. He says: "Have made $250 in single week. R-T-I is entirely responsible for my success."

STARTING SALARY HIGHEST HE EVER EARNED

Harold Apley, 2658 Brookside Ave., Indianapolis, made as high as $30 a week in spare time while getting his R. T. I. training. Starting on a regular job, obtained because of his training he said: "This job is starting me in at better pay than I ever got on any job before."

MAIL COUPON *for* FREE BOOK

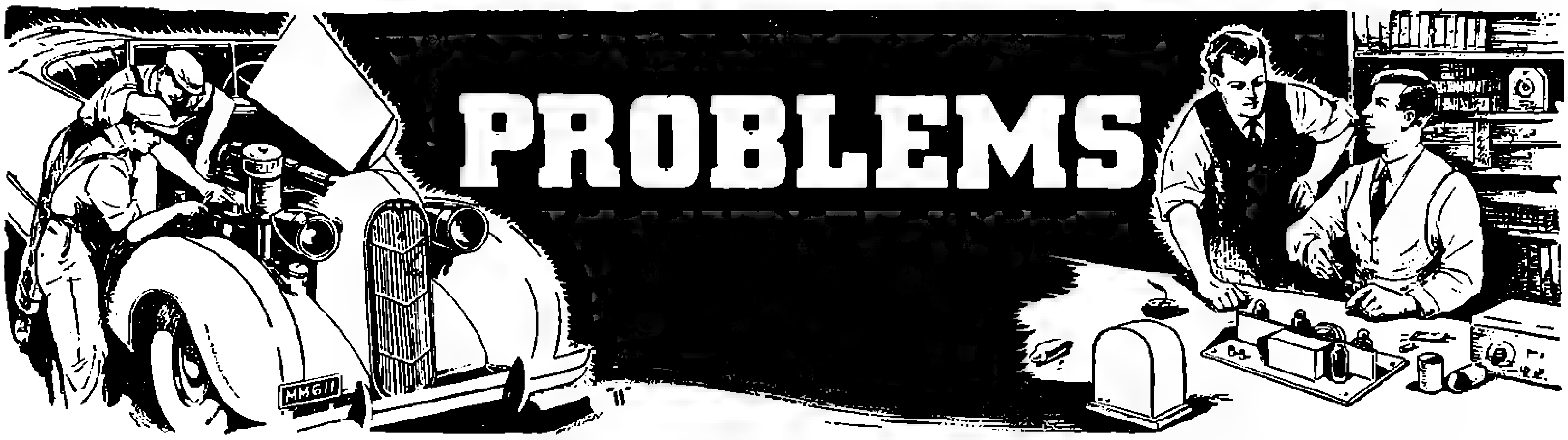
RAY D. SMITH, President,
Radio & Television Institute (R-T-I)
2130 Lawrence Ave., Dept. 31,
Chicago, Ill.

Without obligating me, send me your book that explains your Engineer-Directed and Industry-Endorsed method of training men quickly and inexpensively at home in their spare time to be Radio Experts.

Name ------------------------------

Address ------------------ Age -----

City ------------------ State ------



EDITORS ANSWER READERS QUERIES

REDUCING ELECTRIC STOVE'S HEAT

I have an inexpensive electric heating plate which at present consumes 500 watts of electricity. Since the heat produced is excessive for my requirements I should like to reduce the wattage consumption by ⅓. Should I add more resistance wire to the grill, take some off or should a transformer be placed in series with one of the heaters' wires in order to reduce the current?—Paul Bartholomae, Chicago, Ill.

If there is sufficient room for it in the grill more nichrome resistance wire can be added to the heating unit until the desired temperature is attained. Otherwise this resistance will have to be wound on a separate porcelain form and mounted externally. If a gradual current increase is desired a brine rheostat may be used. This is nothing more than a gallon crock filled with a salt solution and in which metal rods are suspended. The rods are connected in series with one of the heater leads and increase the current flowing into the heater when brought near each other.

CONCEIVES AUTO ACCESSORY

A few weeks ago I submitted a motorized idea for a clothes compartment to a leading automobile manufacturer for consideration. The compartment is designed so that it becomes part of the front seat and permits clothing to be hung up without it becoming wrinkled. The manufacturer informed me that on previous occasions they had seen similar devices and thanked me for the suggestion. What I would like to know is, where do I come in if they use this type of compartment in their product?—Bruce Knoch, Pittsburgh, Pa.

Since the manufacturer stated that the idea was not new to them (evidently having already secured patents on the device) there is little chance of you receiving anything for the idea. According to the United States Patent office the person who files the patent first, unless earlier proof can be furnished, is the rightful owner of the idea. In your case the automobile manufacturer has sole rights to the idea.

RECLAIMING OIL FOR DIESEL USE

I have been told that many power utility companies employ special filters for reclaiming old cylinder oil so that it can be used again to operate diesel engines. I have noticed that old cylinder oil is considerably thinner after being used in a motor, therefore I am somewhat skeptical about the authenticity of this. Is such a reclaimation process really possible?—Joseph J. Walter, St. Joseph, Mo.

Whether or not a reclaimation process such as you mention is really being used we do not know, but it is not at all an impossibility. Properly filtered, so as to remove all grit, the oil could be used for diesel engine fuel. It would have in this used state the same or nearly the same body consistency as regular diesel fuel.

CHARGING BATTERIES ON 32 VOLTS

I have a 32 volt farm lighting plant, but no batteries to go with it. Can this plant be used to charge a 6-volt automobile storage battery and if so, how?—Mrs. John W. Kline, Iowa Falls, Iowa.

A farm light plant provided with the necessary resistance to drop the output to a current suitable for re-charging a 6-volt battery would be possible, but not practical from the standpoint of cost. For recharging a battery in the most economical way we recommend a windcharger plant. This device consists of a salvaged automobile generator geared to a propeller. The propeller revolving in the breeze turns the generator to produce sufficient current for charging a storage battery. Plans for building a windcharger plant are available from MM at 50c.

COPING SAW PLAYGROUND PROJECTS

Being a recreational supervisor and in search of projects suitable for children to make with hand coping saws I am seeking your assistance. Can you tell me where I can secure patterns for plywood garden decorations and similar projects that will not be too difficult for them to make?—Miss Selma Boyer, Ray, North Dakota.

An article on simple woodworking projects for the young folks appeared in the December issue of Modern Mechanix under the title, "Simple Gift Projects For Junior Craftsmen." This article described the making of Chessmen, Hors D'Oeuvres and other novelties of a similar nature. Addresses of firms supplying patterns for lawn decorations will be mailed upon receipt of a stamped-addressed envelope.

ALUMINUM FOR CASTINGS

Is aluminum suitable for home metal casting? I have several articles which I would like to cast in this metal, but would first like to know its melting point and its adaptability to this use?—Edgar Chaisson, Berlin, New Hampshire.

Aluminum melts at 1300 degrees F. If you have access to a small metal furnace operating on city gas you can easily use aluminum for casting metal articles. If you have never before done any casting we suggest that you read the article, "Metal Casting In Aluminum and Bronze," which appeared in the December issue of Modern Mechanix for valuable information on the subject.

(Editor's Note: Your questions will be answered personally and free of charge by MM experts provided they do not require special research or involve trade secrets. Names and addresses of manufacturers of new products described in this issue can also be obtained free upon request. Enclose a self-addressed and stamped envelope for reply. Address: Problems Editor, Modern Mechanix Publishing Co., Greenwich, Conn.)

To help you answer these 3 questions:

1- *What are today's opportunities in Drafting?*

2- *Will I like the work?*

3- *Can I learn Drafting readily?*

2 Beginning Lessons in Drafting Free

Drafting Opportunities Growing Daily

Before anything can be made or built, the Draftsman *first* must draw it. Building trades, transportation, manufacturing — ALL depend on him. That is why *any* pickup in *any* line means *first call for the Draftsman!*

Fit Yourself for a Job with a Future

Drafting welcomes ambitious men — offers good pay to start, with splendid opportunities for promotion. One of the *steadiest* of all lines. Right from the start, the beginner works side by side with experienced men—inking in their drawings, making tracings, constantly profiting by his contact with seasoned engineers. The "higher ups" see his work. If it is good, advancement is sure and steady.

Pleasant, well-lighted offices are the Draftsman's workroom. He keeps regular hours, with congenial, high grade fellow workers. The work is fascinating—embraces not just *one* line, but *hundreds.*

Drafting Experience NOT Necessary

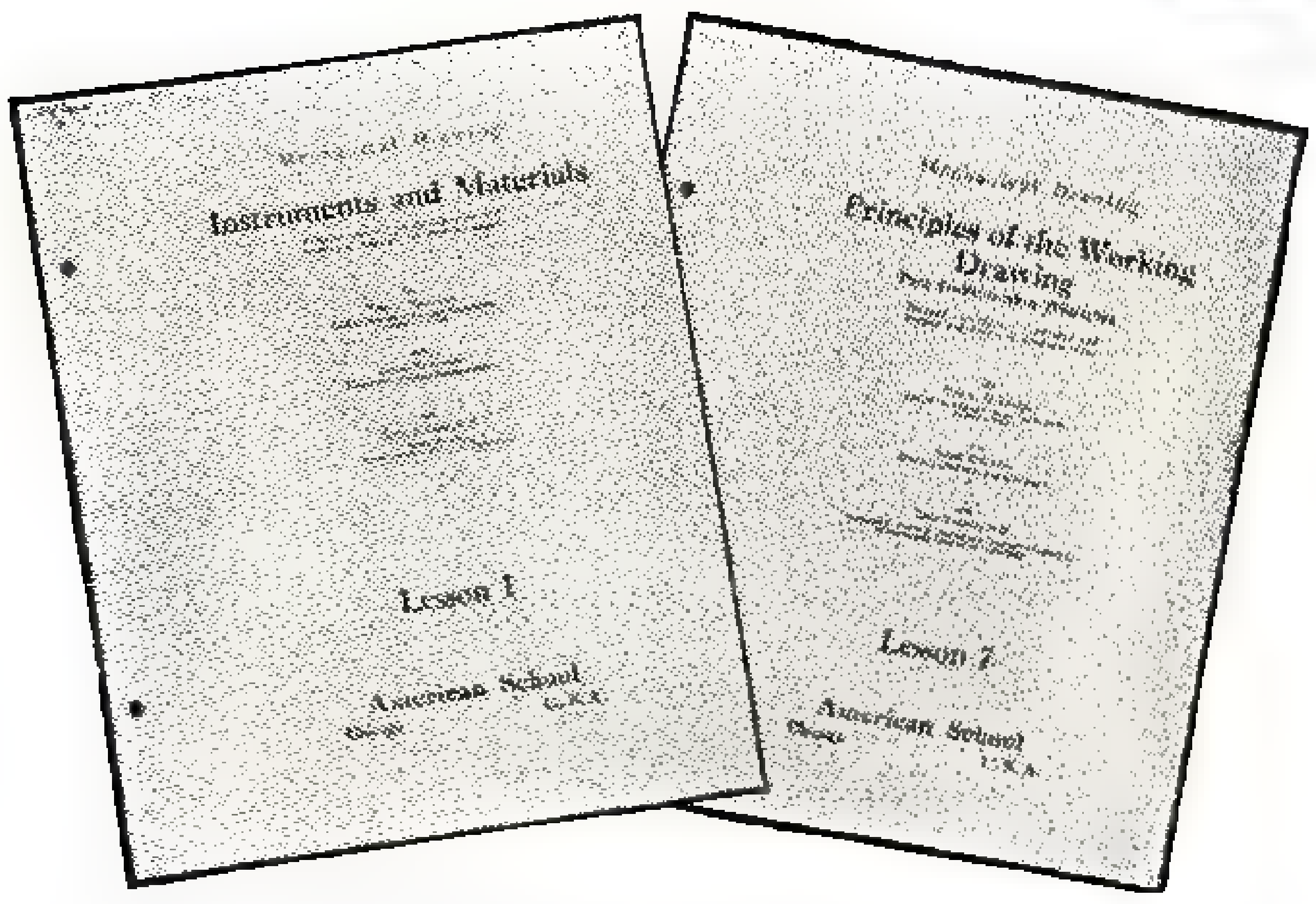
You can master Drafting readily by home study because you learn and advance *exactly* as professional Draftsmen work—with T-square, dividers and drawing board. *Actual* working conditions are duplicated to the final detail. *Thousands* of successful graduates enthusiastically endorse American School methods, nowhere better exemplified than in our Drafting course.

We want you to see for yourself—before you come to ANY decision—exactly what Drafting is like. We want you to judge your own interest in the work—and our ability to teach you. So we make this 2 Free Lesson Offer.

American School, Drexel Ave. at 58th St., Chicago, Ill.

Prove That You Can Qualify

The 2 lessons will be sent absolutely without obligation. In the privacy of your own room, look them over. See how simply you start—how gradually you are led step by step—how thoroughly you master each point—how, as time goes on, you can pass from a raw beginning to complete *mastery* of Drafting—able to get and hold a pleasant, profitable, steady job. Such a future is well worth looking into RIGHT NOW, so . . . just mail the coupon!



Mail Coupon for 2 Lessons FREE

American School, Dept. DD-128
Drexel Ave. at 58th St., Chicago

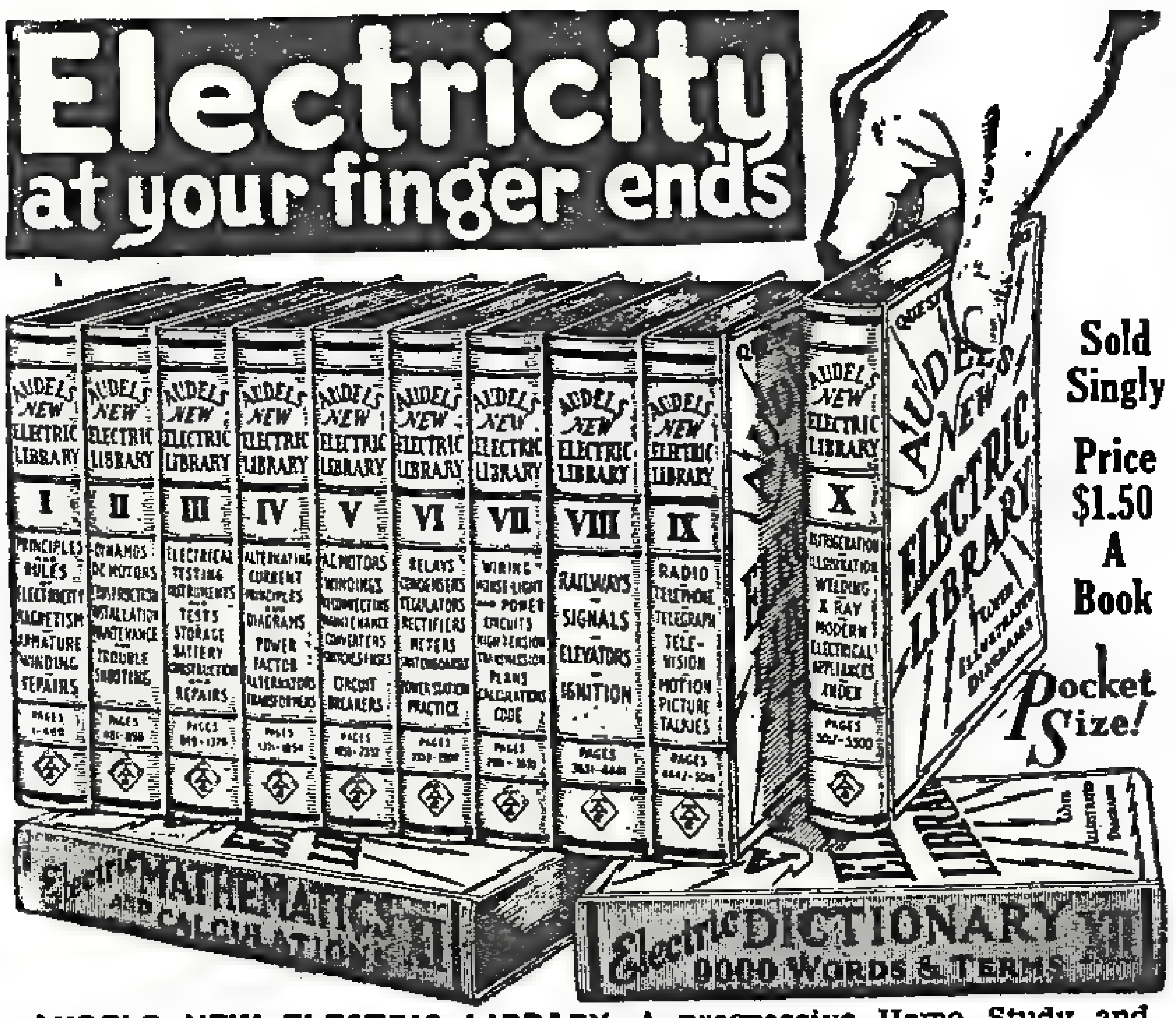
Without the slightest obligation, send 2 beginning Drafting Lessons and free Bulletin. I am not to return them.

Name...*Age*..........

Address...

City...*State*..........

Electricity at your finger ends


AUDELS NEW ELECTRIC LIBRARY
I
II
III
IV
V
VI
VII
VIII
IX
X
Electric MATHEMATICS AND CALCULATIONS XI
Electric DICTIONARY XII
9000 WORDS & TERMS

Sold Singly Price $1.50 A Book

Pocket Size!

AUDELS NEW ELECTRIC LIBRARY—A progressive Home Study and Reference Course in applied electricity. Easy to understand. Questions and answers plainly written for a complete working knowledge of modern electrical practice, necessary to every electrician, engineer, mechanic and student.

LEARN THE AUDEL WAY! You ask the question—Audels New Electric Library gives the answer—9500 simplified outlines, graphic illustrations and precise explanations covering Construction, Operation and Machine Maintenance.

BOOK A MONTH PLAN—Order the volume that interests you—today! We will send that volume on 7 days' free trial. If the book helps you, send us $1.50. If it does not help you, mail book back to us. On receipt of your first payment, we will send your second book. We allow 30 days to pay for this and for each following book until you complete the Series.

If you are not satisfied, you may cancel your subscription at any time.

FREE EXAMINATION COUPON

Theo. Audel & Co., 49 W. 23rd St., New York City

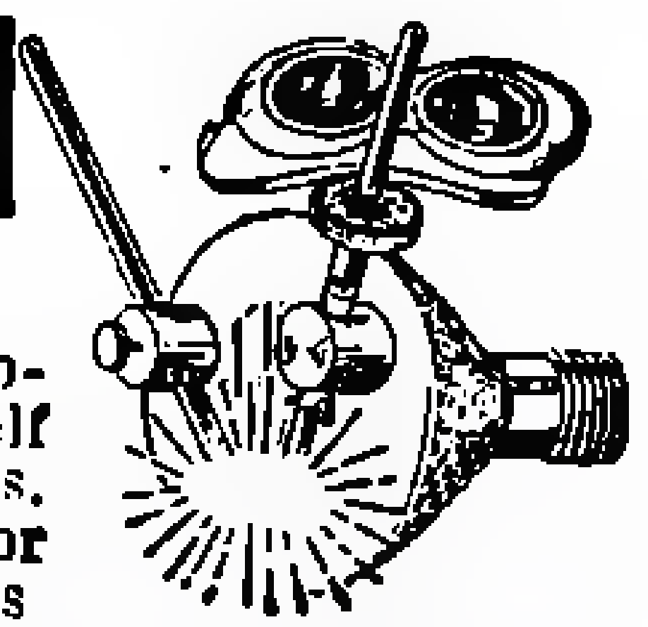
Mail Vol. I, Electric Library on 7 days' free trial. If O. K. I will remit $1.50, otherwise I will return it. I also request you to mail one book each month on same terms. No obligation unless I am satisfied.

Name ....

Address ....

Occupation .... M.M.

SUN Health LAMP



$3.39

World's Lowest Priced!

Enjoy radiant health. Improve appearance! "Sun" Tan yourself quickly, safely, anywhere indoors. Plug lamp into any light socket for Ultra Violet or Infra Red Rays, Vitamin D. Does work of lamps costing 15 times more. Free Carbon Rods and Goggles. Rush $3.39. Transportation Paid. Satisfaction Guaranteed.

PROFESSIONAL PRODUCTS, Dept. 116-S, Silverton, Ohio

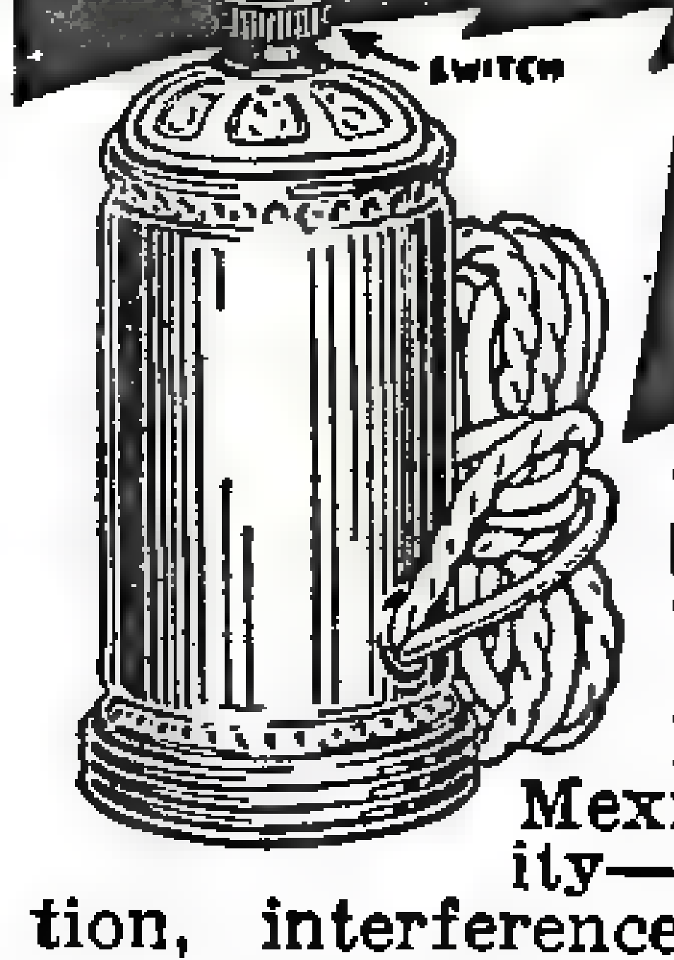
INVENTORS

BE SUCCESSFUL

Read Invention & Finance—it's your chance to make money. Year subscription 60c entered upon promise to pay on receipt of first copy. Place your order by cutting out and mailing this advertisement.

INVENTION & FINANCE MAGAZINE
80-H WALL ST., NEW YORK, N. Y.

BRING YOUR RADIO UP TO DATE



ADD-A-TUBE

Get Rid of Static, Distortion, Strong Local Interference, A "New Radio" For Only............ $1

Tune out strong local stations . . . tune in Los Angeles, Canada, Mexico! Increase selectivity—cut out static, distortion, interference, with amazing new ADD-A-TUBE. Uses no extra current, fits any radio, electric or battery, works on inside or outside aerial, all waves. GUARANTEED! Use 5 days. If not delighted, return within 10 days from date shipped and your money will be refunded instantly!

Send No Money! Pay nothing now. Just send name and address on postcard. Pay postman only $1.00 plus few cents postage on delivery. Send your order today!

R-E ENGINEERS, Dept. K-404, Marburg Ave., & B & O. R.R. Cincinnati, O.

AMAZING MYSTERY MINERAL

Reconditions Motors Like Magic!

Just Spray MOTO-NU Into Cylinders Thru Spark Plug Openings

MOTO-NU is compounded from strange new mineral which expands rapidly when heated. Special rubber applicator draws up MOTO-NU from glass jar and deposits it on pistons through spark plug openings. Motor heat expands MOTO-NU—transforms it into soft aluminite metal which fills scored cylinders, expands worn rings, increases compression. RESULTS GUARANTEED. Saves rebore job and new rings. Cuts gas and oil costs. Gives new power and pep to car.

DISTRIBUTORS—Make Big Money!

Millions of cars and trucks need MOTO-NU! Lifetime opportunity to build your own business. Sell garages, service stations, car owners, dealers. Write at once for FREE DEMONSTRATOR SAMPLE and Distributor's "No Risk" money-making plan.

FREE DEMONSTRATOR SAMPLE

MOTO-NU CORPORATION 236 W. 55th St., Dept. G, New York

CARTOON YOUR WAY TO SUCCESS!

DON'T COPY — LEARN TO ORIGINATE!

RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS at home that you can SELL! Course has 26 lessons and 600 illustrations. *Send name and address for free details.* Only.... $2.85

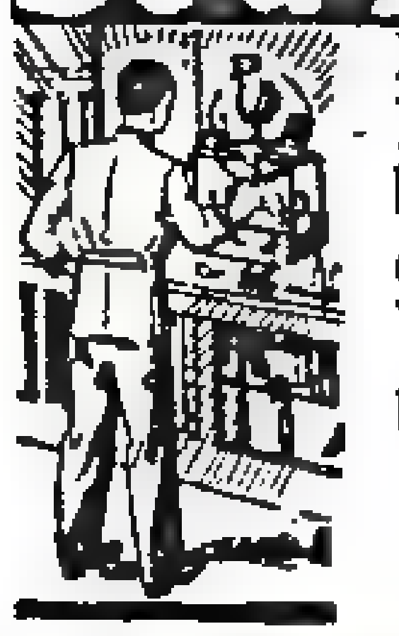
RAYE BURNS SCHOOL, Dept. F-X, Box 2194, CLEVELAND, OHIO

WHY RENT A BOAT? MAKE YOUR OWN

Even a child can build at least one of the many boats that are described in the big new 148-page book, *How To Build 20 Boats.* Send 50c for your copy, now.

MODERN MECHANIX PUBLISHING CO.
GREENWICH, CONN.

Be a TELEVISION EXPERT



Here's opportunity! Get ready for the best paid jobs in Radio as Television sweeps the country. Train at big-time broadcasting station. Get actual experience over our Television Station W9XAL and commercial station W9XBY. Write today for free folder and literature showing actual photos of Television broadcasting, opportunities, etc.

FIRST NATIONAL TELEVISION, INC.
Dept. GG1, Power & Light Bldg., Kansas City, Mo.

HOW TO SUCCEED IN PHOTOGRAPHY

BIG OPPORTUNITIES AS AN EXPERT PHOTOGRAPHER

You can have a fascinating, profitable career in the World's newest, big profession. Become a Commercial, News, Portrait or Advertising Photographer, or Movie Cameraman. Big money-making opportunities. Personal Attendance or Home Study training. Individual, practical instruction. 27th year. Write for FREE Booklet.

NEW YORK INSTITUTE OF PHOTOGRAPHY
10 West 33 Street (Dept. 153) New York, N. Y.

LEARN WATCH REPAIRING

AT HOME You can learn by our modern and original system of instruction every part of the Watch repairing Trade at home. You can earn money while learning and prepare yourself for a well paying position or start in business after completing our course of instruction. Good watch repairers are in demand and generally earn very good salaries. For particulars apply to the

WISCONSIN SCHOOL OF WATCH REPAIRING
524 E. Mason St., Dept. C, Milwaukee, Wis.

SPECIAL SALE "100 SHOT" REPEATER

$4.95

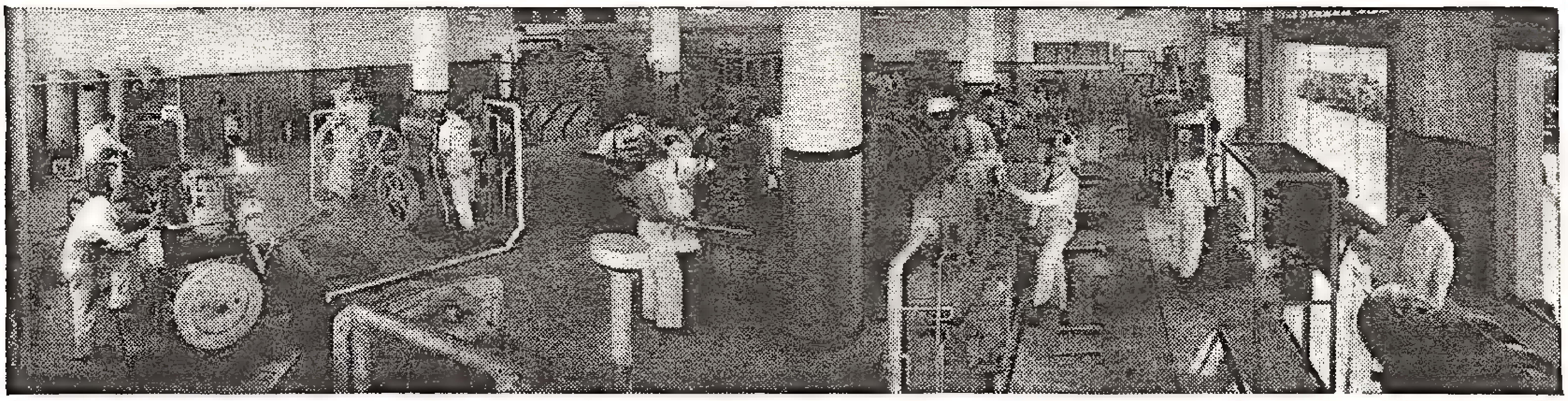
Latest Model 1937 Haenel repeating pistol. Sturdy, massive construction. 100 shot magazine. Shoots B. B. steel shot. **FREE—500** Shots.

BENJAMIN AIR PISTOL .177 or .22 cal. $6.95 $2.00 deposit on C. O. D.

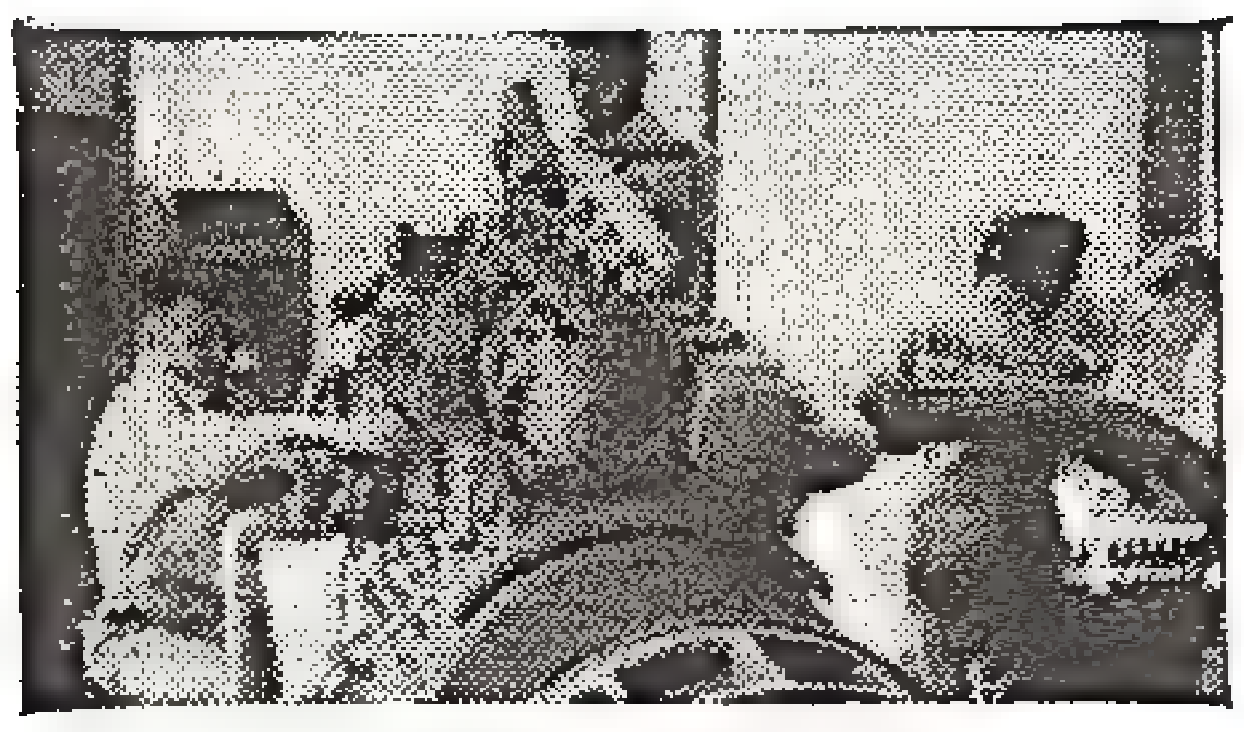
FREE—Folder on Rifles, Pistols, etc.

Hudson Sporting Goods, M-52 Warren St., New York

Learn DIESEL *and* GAS ENGINEERING



Partial view of Diesel-engine operating room—one of the important Departments at National Schools.



Students servicing Fairbanks-Morse Diesel power generating unit.

Special Added Feature!

DIESEL ELECTRIC POWER GENERATION

In keeping with National Schools' progressive policy of offering the most complete Course, we announce this added feature, made available to you by an investment on our part of thousands of dollars.

Full instruction includes:

Alternating and Direct Current Power Stations
Switchboards and Instruments
Station and Motor Wiring
Motors and Controls
Distribution Lines, Transformers, etc.

This specialized training enables our graduates to expertly handle Diesel equipment in power plants, mines, public buildings and utilities, boats, trains, etc. Knowledge of Diesel Electrics is just as essential as the fundamentals of Diesels. This school is the only one in the U. S., to our knowledge, offering this extra, yet necessary, specialized training.

YOU WORK ON FINEST and LATEST EQUIPMENT AVAILABLE IN AMERICA

National Schools' course of Diesel Training is the outgrowth of years of successful development. The instruction is PROVEN. Over 30,000 graduates have received National Training. Now, National offers the most comprehensive training—actually three complete courses for the price of one—Gas and Diesel Engineering, and Electric Power Generation—all of which are absolutely essential to qualify for best jobs.

Easy, Fascinating "Shop-Practice" Method

The day you begin your training at National you start right in with a practical job on the most modern Gas and Diesel equipment, including Caterpillar, Cummins, McCormick-Deering, Hercules, Venn-Severin, Fairbanks-Morse, Enterprise, and many others. The work is actually a pleasure for students—easy to understand—ever-fascinating You learn in a few months what would ordinarily take far longer.

Complete, Modern Equipment Actually Used by Students

The vast installation of modern Gas and Diesel equipment here is all used by you in learning your trade. You learn to assemble and dis-assemble all parts, learn trouble-shooting; operating and all essentials to qualify you for big-pay Gas and Diesel opportunities. Your instruction is personalized under direct supervision of a large staff of experts.

LEARN IN LOS ANGELES, Playground of America

RAILROAD FARE ALLOWED

For a limited time, coach R. R. fare allowed to L. A. from any part of the U. S.

EARN ROOM AND BOARD

We help students obtain part-time jobs to earn room and board while learning.

NATIONAL SCHOOLS, LOS ANGELES

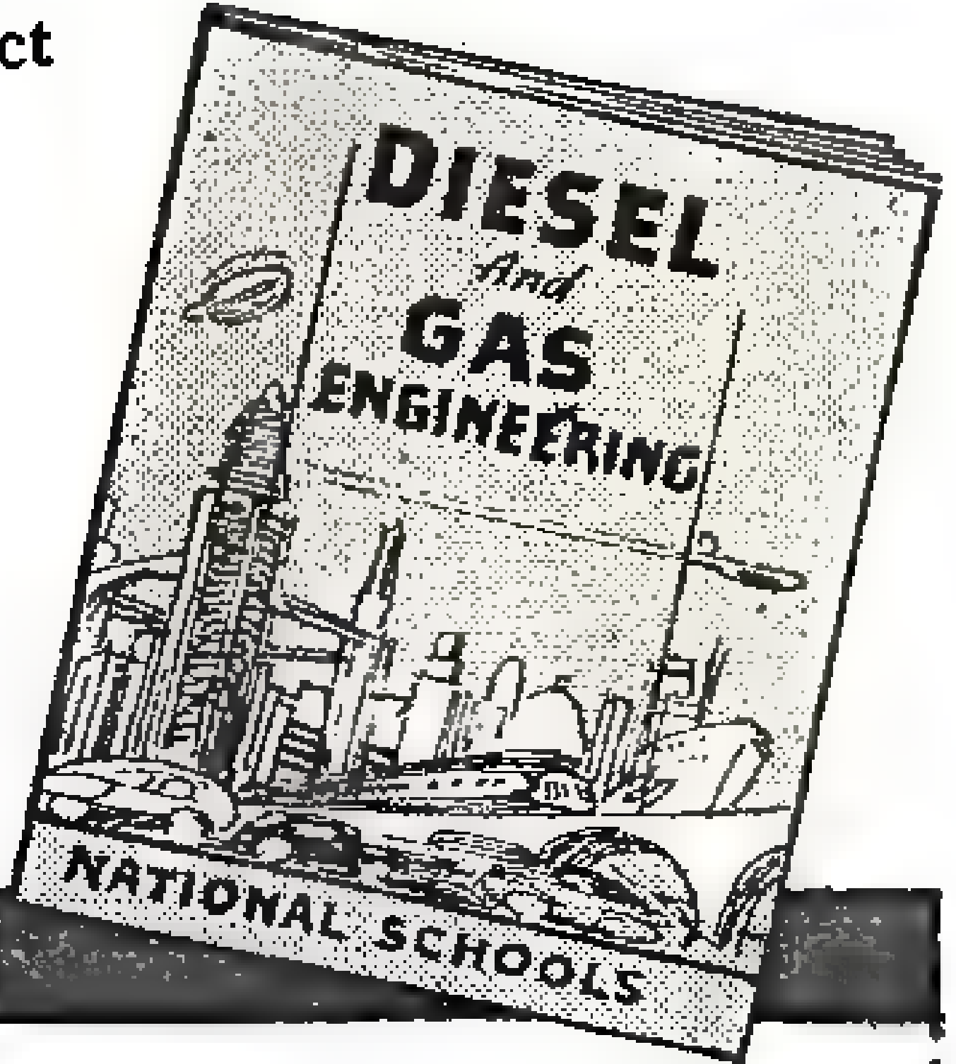
Established 1905

Electrical trouble-shooting in gas engine department.

QUALIFY FOR GOOD PAY JOBS

NATIONAL'S

Master Training Includes
All Phases of
Diesel Engines
Fuel Injection
Gas Engines
Butane Engines
Propane
Natural Gas
Auto-Diesel Electrics
Also Diesel Power Generation
Machine Shop
Batteries



MAIL THIS COUPON

NATIONAL SCHOOLS, Los Angeles, Calif.
Dept. 1-MMA, 4000 So. Figueroa St.

Please send Catalog

NAME ....AGE ....
ADDRESS ....
CITY ....STATE..............

Sensational BARGAINS

Guaranteed
$102.50 Model
NOW Only
$44.90 Cash
or
On Easy Terms
SMALL CARRYING CHARGE
10 Day Trial
No Money Down

Fully GUARANTEED

Positively the greatest bargain ever offered. A genuine full sized $102.50 office model refinished Underwood No. 5 for only $44.90 (cash) or on easy terms. Has up-to-date improvements including standard 4-row keyboard, backspacer, automatic ribbon reverse, shift-lock key, 2-color ribbon, etc. The perfect all purpose typewriter. Completely rebuilt and FULLY GUARANTEED.

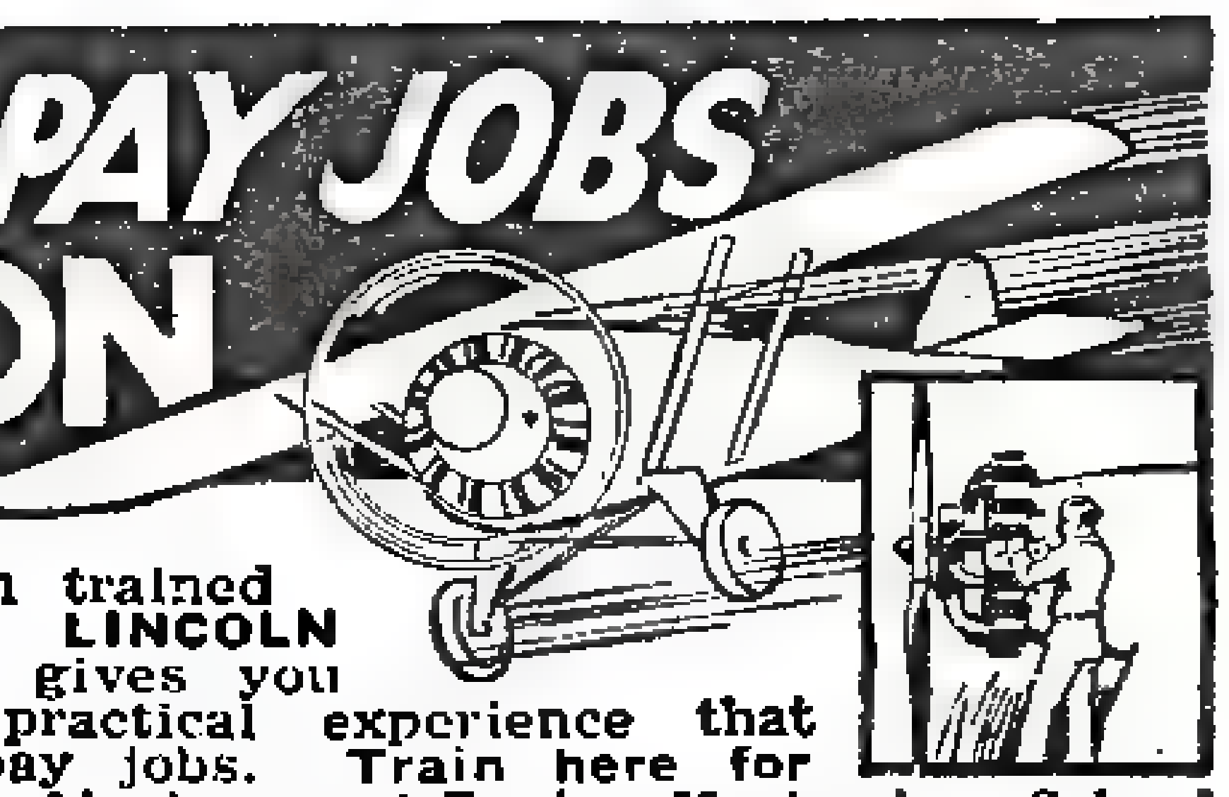
Learn Touch Typewriting
Complete (Home Study) Course of the famous Van Sant Speed Typewriting System—fully illustrated, easily learned, given during this offer.

Money Back Guarantee
Send coupon for 10-day Trial—if you decide to keep it pay only $3.00 a month until $49.90 (term price) is paid. Limited offer—act at once.

INTERNATIONAL TYPEWRITER EXCHANGE
231 West Monroe St., Chicago, Ill., Dept. 105
Send Underwood No. 5 (F. O. B. Chicago) at once for 10-days' trial. If I am not perfectly satisfied I can return it express collect. If I keep it I will pay $3.00 a month until I have paid $49.90 (term price) in full.
For quick shipment give references and occupation
Name ____________________________Age ________
Address ____
Town ____________________________State ________

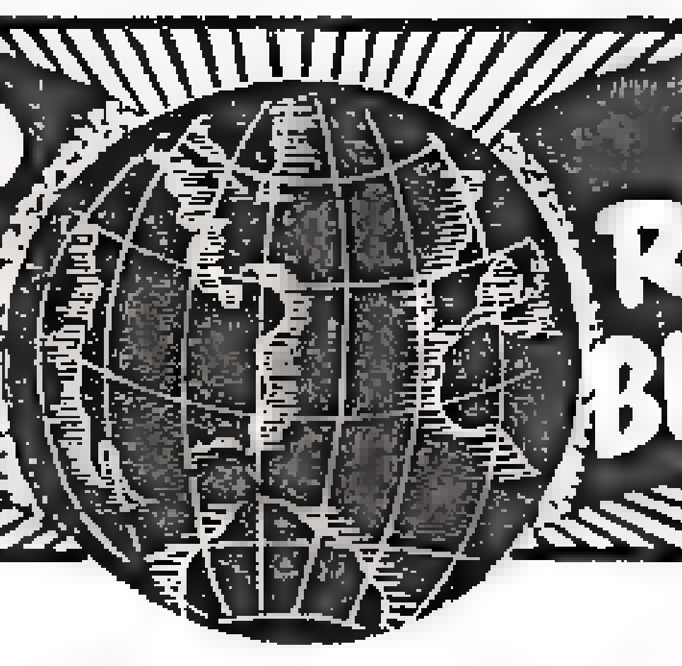
Train Now at LINCOLN

for the BIG PAY JOBS IN AVIATION



Airlines, Factories, Operators are calling on us for Lincoln trained pilots and mechanics. This **LINCOLN Government Approved School** gives you the complete training and practical experience that qualify you for these good pay jobs. Train here for **Government License as Pilot or Airplane and Engine Mechanic.** School now in 26th year; 16 years teaching aviation. Graduates receiving immediate employment with leading Airlines, Factories and in Foreign Countries. **WRITE for Catalog.** Please state age. **LINCOLN AIRPLANE & FLYING SCHOOL, Division of LINCOLN AERONAUTICAL INSTITUTE (INC.), 407F AIRCRAFT BLDG., LINCOLN, NEBRASKA.**

THE WORLD IS YOURS ON A RADIO BUILT by YOU



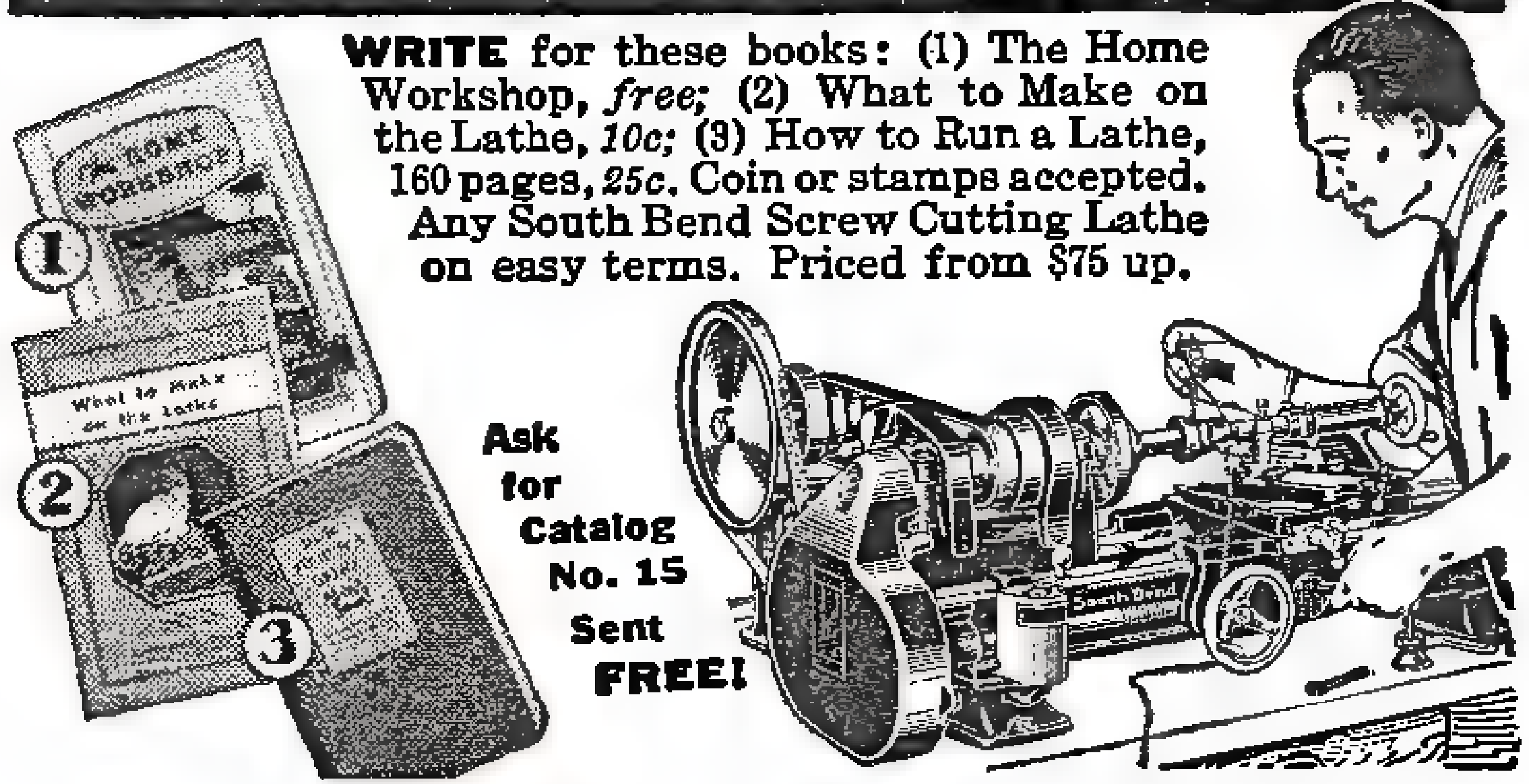
There's nothing like that lift you get when you bring in foreign stations on a swell radio you've built yourself. Lads from 8 to 80 indulge in this fascinating outlet to their mechanical bent. Build any of the circuits described in this magazine. Wholesale can supply parts for all of them. Write for full parts list. It's FREE. Give Electrical Gifts—they last! Our special Xmas Catalog No. 65-A22 contains hundreds of unheard of values. Latest models of RADIOS, ELECTRICAL TRAINS, TOYS, HOUSEHOLD APPLIANCES, etc. Send for it. It's full of bargains and it's FREE.

SEND NOW FOR FREE CATALOG

WHOLESALE RADIO SERVICE CO. INC.
CHICAGO, ILL. • NEW YORK, N. Y. • ATLANTA, GA.
901 W. JACKSON BLVD. • 100 SIXTH AVENUE • 430 W. PEACHTREE ST. N. W.
BRONX, N. Y. • NEWARK, N. J.
542 E. FORDHAM RD. • 219 CENTRAL AVE.

WHAT TO MAKE *and how to make it* ON A LATHE

WRITE for these books: (1) The Home Workshop, *free;* (2) What to Make on the Lathe, *10c;* (3) How to Run a Lathe, 160 pages, *25c.* Coin or stamps accepted. Any South Bend Screw Cutting Lathe on easy terms. Priced from $75 up.



Ask for Catalog No. 15 Sent FREE!

SOUTH BEND LATHE WORKS
805 E. Madison Street **South Bend, Indiana, U. S. A.**

RADIO

ENGINEERING, broadcasting, aviation and police radio, servicing, marine radio telegraphy and telephony, Morse telegraphy and railway accounting taught thoroughly. Engineering course of nine months' duration equivalent to three years of college radio work. School est. 1874. All expenses low. Catalog free.
DODGE'S INSTITUTE **Fern St.** **Valparaiso, Indiana**

***New* JOBS *for* THOUSANDS *in* AIR CONDITIONING *and* REFRIGERATION**

34th Year
Get Free "Prosperity Booklet"

If you want steady work—all year 'round—good pay, or a business of your own, prepare NOW. Such ground-floor opportunities are rare. Learn at low cost right in your own home (or at our school in Chicago). Write for FREE **"Prosperity Booklet."**

CHICAGO TECHNICAL COLLEGE
A-316 Tech Bldg., 118 E. 26th St., Chicago

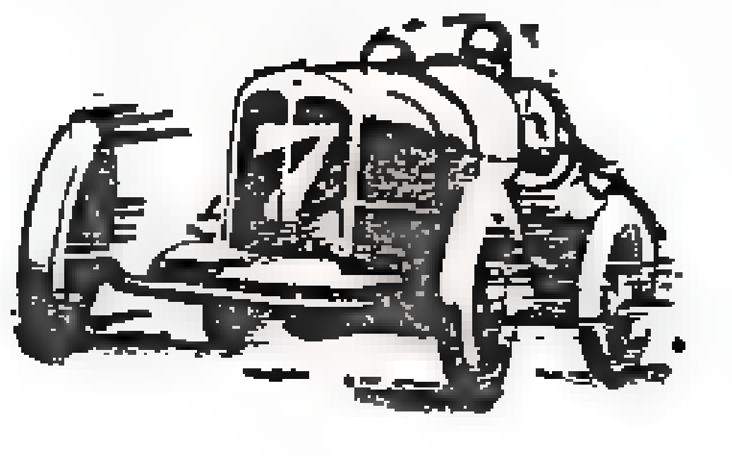
AMAZING NEW BUSINESS
Sell to Stores

Get Set for Life!

MAKE up to $65 WEEKLY
in new kind of wholesale business. Place famous line 5c-10c goods with stores. Merchants grab our FREE GOODS Deals. 200 fast-selling products—all on salesmaking Counter Displays. Up to 140% profit for you and merchant. No experience or investment to start. Big catalog and facts FREE.
World's Products Co., Dept. 1814, Spencer, Ind.

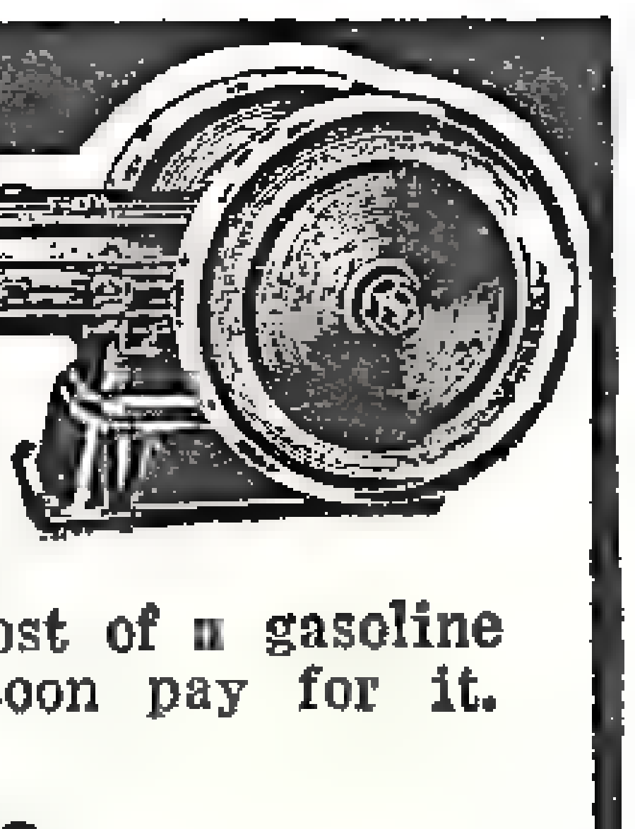
AUTOMOBILE RACING
(Fourth Edition)
New Book

Nine Chapters, 66 illustrations of dirt, midget and championship cars and drivers. How to build cars and bodies; 14 plates working drawings. Converting stock cars to 135 m. p. h. racers. Book answers all questions on speeding up cars, balance, speed revs, rules, specifications, track records, etc. Postpaid $1.00, C. O. D. $1.12. Order NOW.



RAYKUNS, Dept. A-1, Cincinnati, Ohio

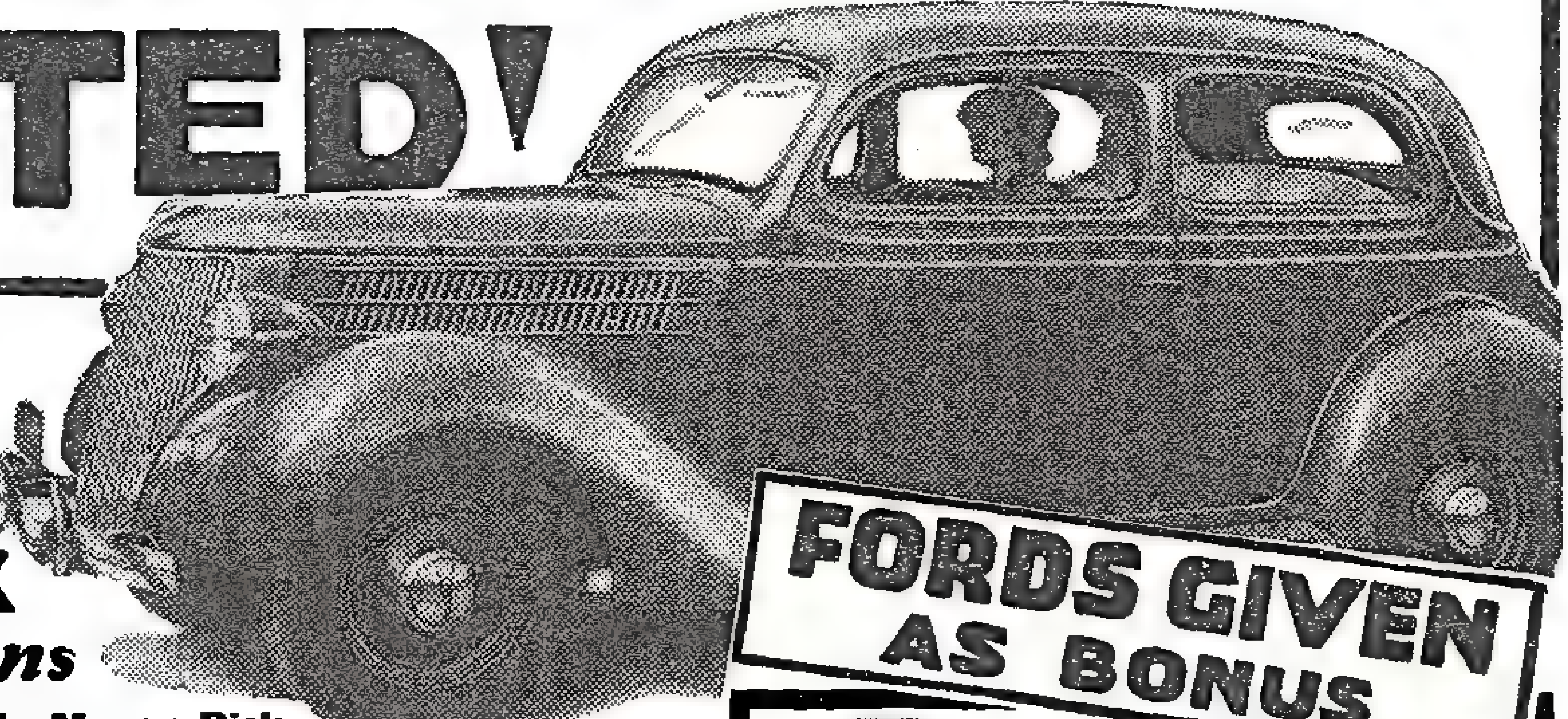
DIESEL ENGINES



Lower your power cost with a smooth-running WITTE Diesel. Operates on non-explosive fuel at one-eighth the usual cost of a gasoline engine. The savings in fuel alone will soon pay for it. 5 and 10 H-P. Also Dieselectric Plants.

WITTE ENGINE WORKS,
1571 Oakland Ave., **Kansas City, Mo.**

FOOD DISTRIBUTORS WANTED!



MAKE UP TO $60.00 IN A WEEK

with my proven plans

I'll Help You Start . . . No Money Risk

I can now give you a remarkable opportunity to make big earnings your very first week. I'll back you with my proven successful plans. If you can put in full time, you may make as high as $60.00 in a week—even spare time pays up to $5.00 in a day. Housewives make up to $22.50 in a week for a few hours. My plan gives you pleasant, permanent occupation with amazing earning possibilities. If you are willing to put in a fair amount of time for a good day's profit, rush me your name today—get all the facts—FREE.

Have a Big-Paying Permanent Business

My plan pays fine profits because you supply everyday household necessities—things people must buy. You simply take care of a regular list of families in your locality, calling on them once every two weeks. You take in all the money and keep a big share for yourself. No previous experience necessary. I send everything complete. You don't risk a penny. Nothing complicated; actually "ready-made" for you. Send no money—just rush your name so I can lay all the facts before you; then you can decide for yourself. Start right in and make money your very first day. Brand new Ford Sedans given to producers as a bonus, besides your cash earnings. Costs nothing to investigate. A postcard will bring free details. Write today—right now.

ALBERT MILLS, 3728 Monmouth Ave., Cincinnati, Ohio

**Started Penniless—
6½ Months Later
Worth $1,200.00**

"Only 6½ months ago I started with your organization without a penny to my name, and today (I just finished my balance) I am worth a little more than $1,200.00. I can hardly believe it possible—such a success in so short a time." Hans Coordes, Nebraska.

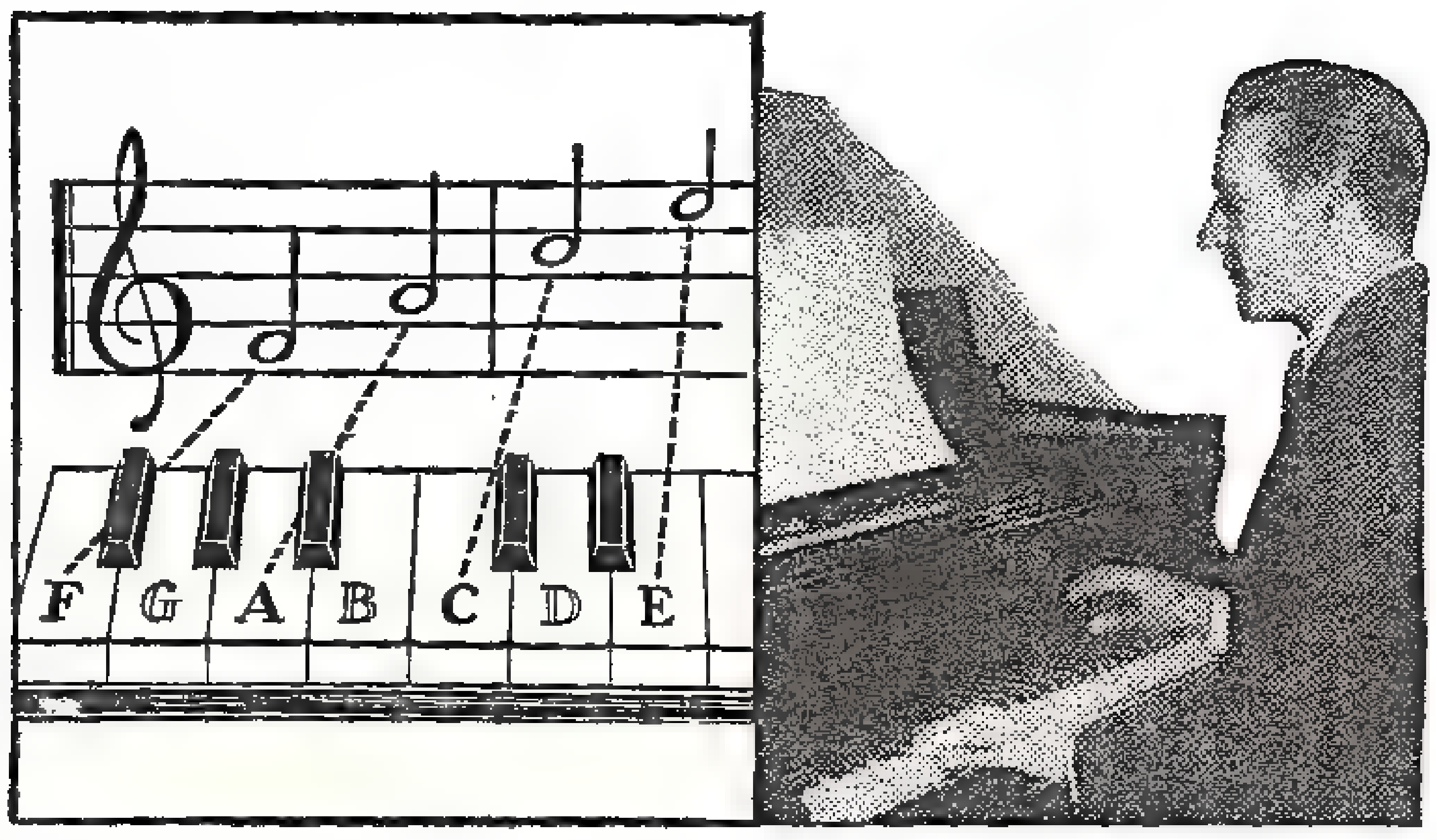
Reported $63.75 In One Week

"I want to thank you for the Ford Tudor Sedan which you gave me as a bonus besides my regular cash earnings. My profits in a single week have been as high as $63.75." G. W. Wright, Maine.

THOUSANDS LEARN MUSIC WORLD'S EASIEST WAY

No Expensive Teachers....No Bothersome Scales....No Boring Exercises

BEGINNERS LEARN REAL MUSIC FROM THE START



Yes, literally thousands of men and women in all walks of life have learned music—have won new friends, become socially popular this quick, modern, easy as A-B-C way.

You, too, can learn to play—to entertain others—to pep up any party—just as these thousands of others are doing. And you can do this without the expense of a private teacher—right in your own home. You don't need to be talented. You don't need previous musical training. You don't have to spend hours and hours playing monotonous scales and humdrum finger exercises. You start right in playing real little tunes. And sooner than you expected you find yourself entertaining your friends—having the best times you ever had.

Easy as A-B-C

LEARN TO PLAY BY NOTE

Piano	Guitar
Violin	Saxophone
Organ	Mandolin

**Tenor Banjo
Hawaiian Guitar
Piano Accordion
Or Any Other Instrument**

The U. S. School method is literally as easy as A-B-C. First, it *tells* you how to do a thing. Then it *shows* you in pictures how to do it. Then you do it yourself and *hear* it. What could be simpler? And learning this way is like playing a game. Practicing becomes real fun instead of a bore as it used to be with the old way.

Prove to yourself without cost how easily and quickly you can learn to play. Send today for Free Demonstration Lesson and Explanatory Booklet. See the simple principles around which this method is built. If you really want to learn music—if you want to win new popularity—enjoy good times galore—mail the coupon below. Don't delay—act NOW. Instruments supplied when needed. Cash or credit.
U. S. School of Music, 2621 Brunswick Bldg., N. Y. C.

**U. S. SCHOOL OF MUSIC
2621 Brunswick Bldg., New York City**

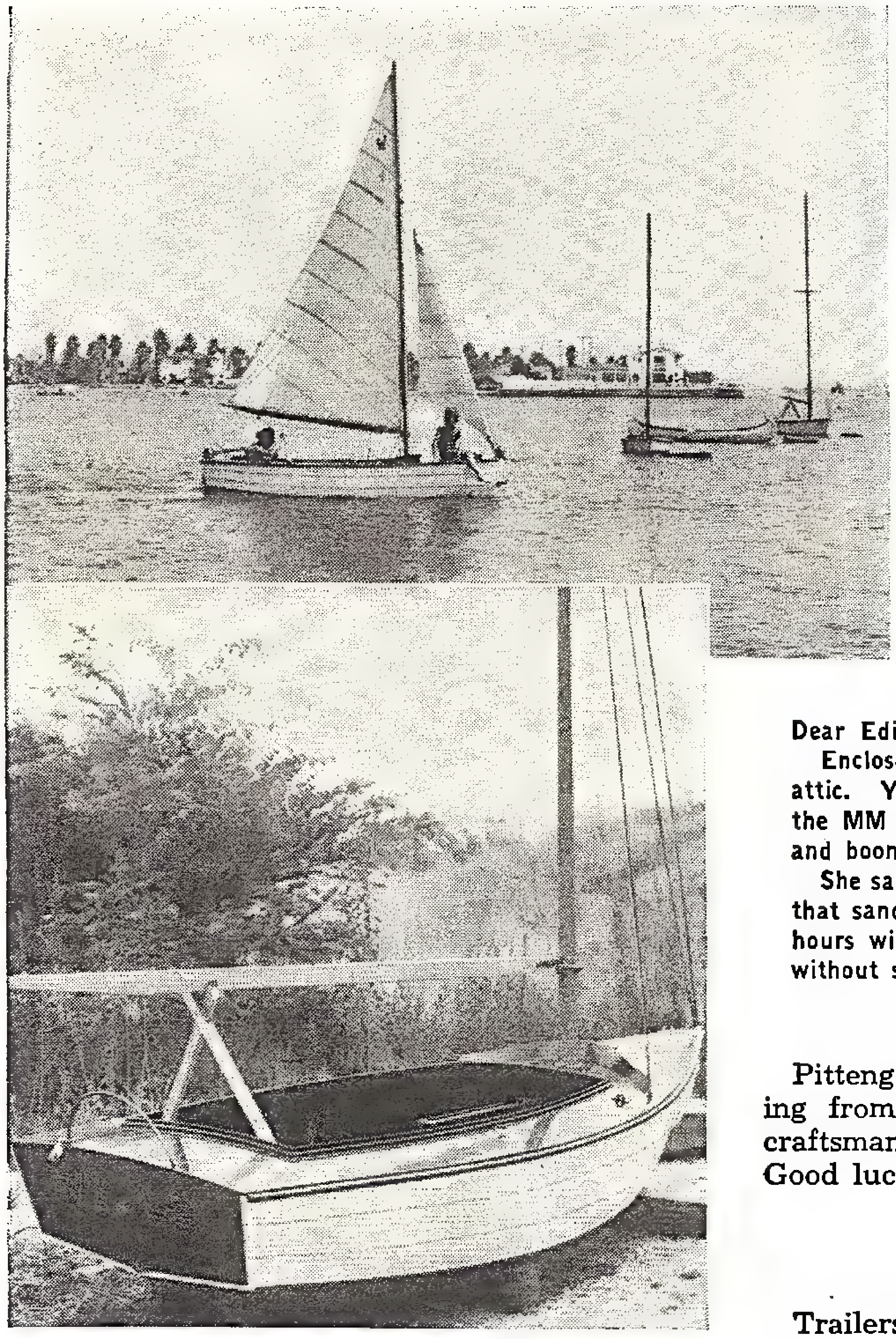
Send me your amazing free book, "How You Can Master Music in Your Own Home," with inspiring message by Dr. Frank Crane; also Free Demonstration Lesson and particulars of your easy payment plan.

Name ....

Address ....

Instrument........................ Have you Instrument?........

Random Chips from



Top—A. D. Pittenger, of Los Angeles, Calif., takes a friend for a sail in NOMAD, a boat built from MM plans. It carries four people. Bottom—Close-up showing construction.

THE mailbag was pretty heavy this month and letters and photos describing many interesting projects completed by MM readers indicate that home workshops are gaining in popularity. From workshops with limited space and a few good tools to spacious shops equipped with lathes, many tools, and other mechanical aids, MM readers are turning out projects of every type and description. Most of them are built from plans that appeared in past issues of MM publications.

***

Talking about making things, don't overlook the new 1937 edition of the MM Handy Man's Home Manual that is now on sale at your local newsstand at 50 cents per copy. If your newsdealer has run out of copies, order one direct from MM at Greenwich, Conn.

Presenting many practical kinks, plans, and detailed instructions for many projects, the manual will be a welcome addition to the library of any workshop fan. Its 144 pages feature over 800 illustrations.

***

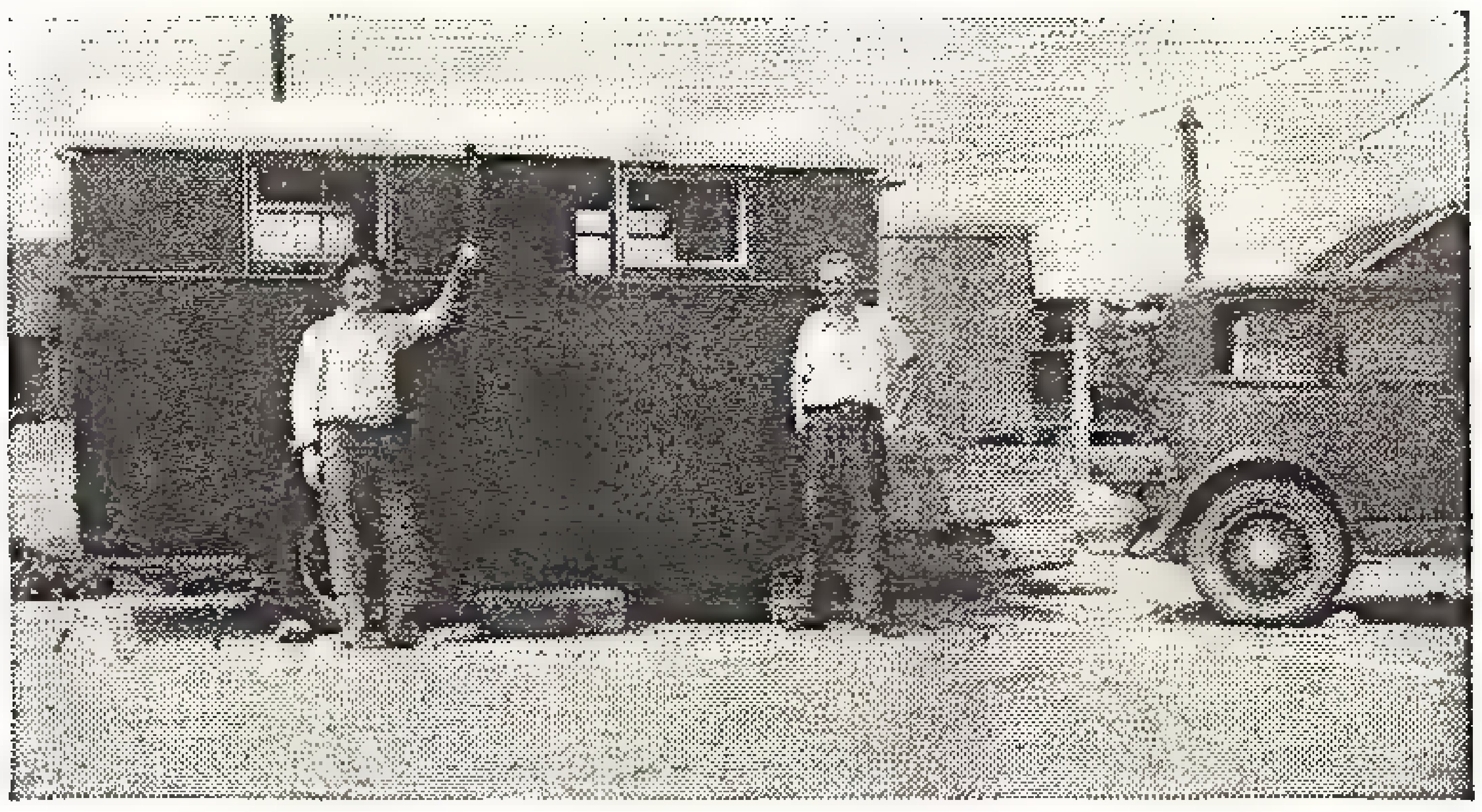
First prize of $5 cash for the most interesting project photo received this month goes to A. D. Pittenger, of Los Angeles, Calif. He says:

> Los Angeles, Calif.
>
> Dear Editor:
>
> Enclosed are photos of NOMAD which I built in my attic. You can see from the photos that I followed the MM plans very closely, even to the hollow mast and boom, although I changed the cockpit a bit.
>
> She sails nicely and I have had her in a blow so hard that sand was flying on the beach. I have sailed for hours with four aboard and have hit some big waves without shipping any water.
>
> A. D. Pittenger.

Pittenger's boat certainly is a beauty and judging from the close-up of the craft, it entails craftsmanship of which he may well be proud. Good luck, Pittenger.

***

Trailers are becoming more numerous and MM readers are quick to show their skill at constructing them as the following letter proves:



A real home on wheels is this trailer built by Howard R. Goldy, of Camden, N. J. Its four bunks, stove, radio, sink, and other household articles insure comfortable traveling.

the Editor's Workbench

Camden, N. J.

Dear Editor:

I am sending you a photo of my trailer. It is 12 feet long and has a chassis similar to the one used by Sir Guy Standing in the MM "How To Build It" book.

Inside the trailer are four bunks, stove, refrigerator, closet, sink, and a home-built five tube radio. I have the MM article describing the CRUISEMITE trailer and would like to make my next trailer like it.

Howard R. Goldy.

Mr. Goldy was awarded a prize of $3 for his trailer photo and letter. He certainly has turned out a creditable trailer and we know he will encounter no trouble in building CRUISEMITE.

***

Midget cars are still a heavy favorite with MM craftsmen and hardly a mail fails to bring several photos of trim little speedsters. A $3 prize was sent to Homer Groce, of Clemson, S. C., who says:

Clemson, S. C.

Dear Editor:

I am enclosing a photo of a car I built. It has a model A Ford motor hooked up to a model T Ford rear-end.

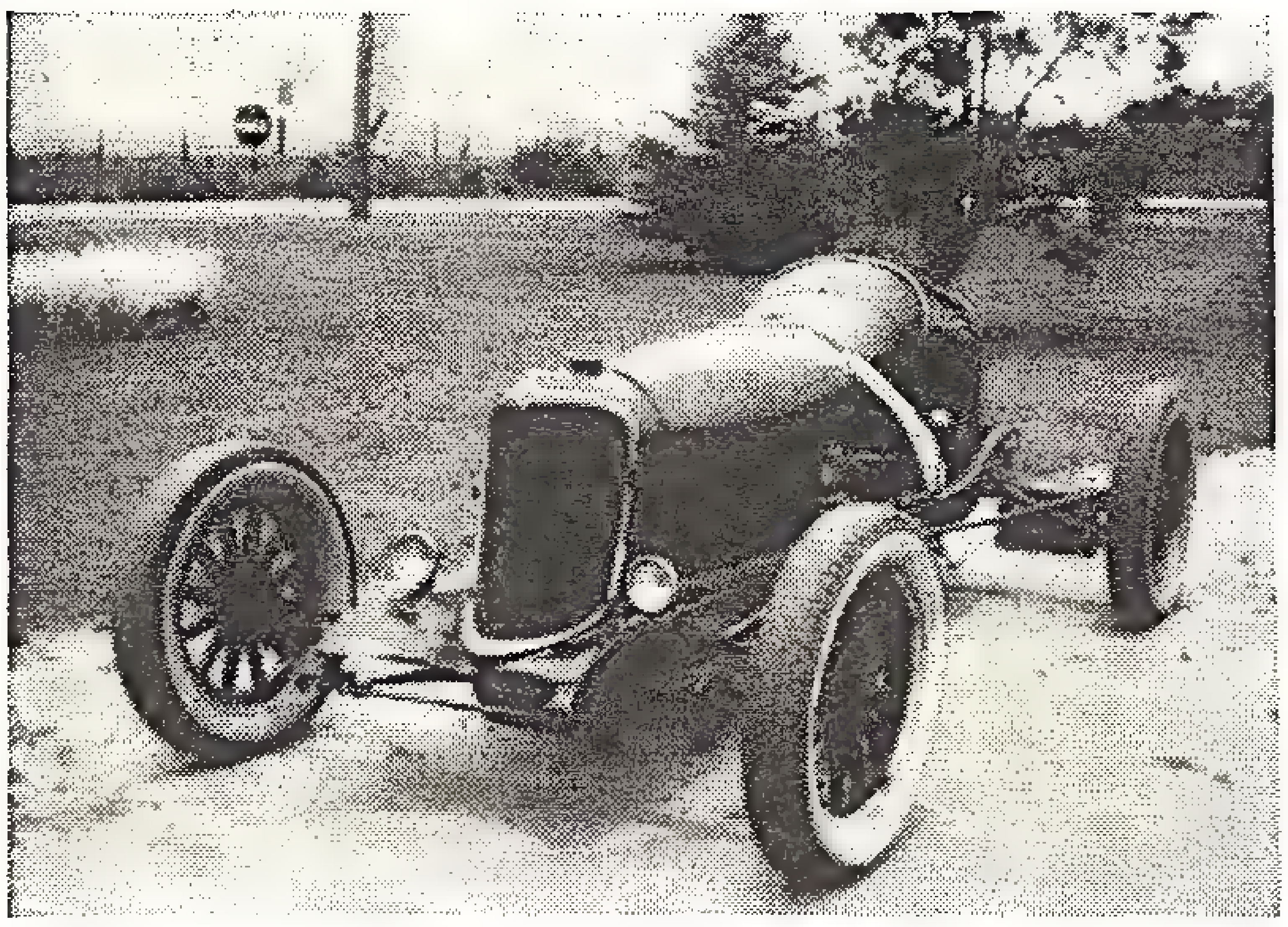
Cooling is accomplished by two radiators, cut down, and placed one in front of the other. I get 28 miles per gallon with the car and it is capable of doing 80 m.p.h. I will gladly answer any questions from MM readers if they include a stamped, return envelope with their inquiries.

Homer Groce.

Here's a chance to get first hand information about a real snappy looking racer. You can reach Mr. Groce at Clemson College, Clemson, S. C.

***

Boats and more boats. All good ones, too. No matter how many workshop letters the editor receives, the number of boat letters and photos far outnumbers the others. Our only regret is that we cannot print more of the letters, but space is limited.



Featuring a double radiator cooling system, this midget racer attains a speed of 80 m.p.h. and travels 28 miles on a gallon of gasoline. It was built by Homer Groce, of Clemson, S. C.

A pleasant sight to the eyes of boat lovers is this trim looking sailboat built from MM plans. BUDDY, as the boat is known, was built in little over a year by Neil Hoyt, of Detroit, Mich.

From Detroit, Mich., comes a letter and photo that secured a $3 prize for its writer.

Detroit, Mich.

Dear Editor:

Here is a picture of BUDDY, built from plans in the MM book—"How To Build 20 Boats." I am very proud of her as she is the first boat I ever built. It cost about $250 and required a year and three months to build.

I am putting outside ballast on the keel this winter as I use her on the Great Lakes. I'll be glad to give any information to MM readers who may wish to build BUDDY.

Neil Hoyt.

We sure envy Mr. Hoyt. He'll be able to make some excellent cruises in BUDDY. He has reason to be proud of her for she is a trim craft and pleasing to the eye.

***

Winter weather always spurs the snow-sled fans and they don't forget to send photos to their

[*Continued on page* 26]

There's Quicker, Bigger MONEY For YOU-in POULTRY

Earn $1,000 to $2,500 a Year or Have a Business of Your Own!

Whether you want a job at good pay or a highly profitable business of your own—the Poultry Industry offers you more than any other. There's a shortage of poultry meat and eggs — a shortage of trained poultrymen. I'll train you quickly at home—to fill a good job in Poultry—and our FREE Students' Employment Dept. will help you get one!

SEE HOW EASY IT IS TO START—CASH IN QUICK

Modern "factory" methods—using a brooder—make it easy for you to raise poultry in limited space. Start in your garage, basement, or barn. Raise friers and broilers—they're ready for the cash market without ever being taken out of the battery brooder. No farm needed. City folks can make $1,000 to $2,500 a year. I'll show you how to make a tiny investment grow automatically. What I've done for thousands of others I can do for YOU.

FREE Book Shows the Way to Big Pay and BIG Profits

Mail coupon below TODAY—for my Big NEW FREE Book, "How to Raise Poultry for Profit." My forty years of experience are yours. The Poultry Industry needs YOU. You need my book. Get it—and get in line for the BIG Money that's waiting for you in POULTRY.

Mail NOW for FREE Book

NATIONAL POULTRY INSTITUTE, Dept. 133-B
Adams Center, N. Y., Harry M. Lamon, Pres.

Dear Mr. Lamon: Send me your FREE Book, "*How to Raise Poultry for Profit*." I want to know more about my opportunity to make $1,000 to $2,500 a year, spare or full time.

Name..

Address..

Be An ARTIST

Make $35, $50, $75 a Week

Learn at Home This Simple, Practical Way

More and more trained Artists are needed each year. Hundreds of magazines, advertisers, newspapers, printing houses, etc., pay good money for art work. Our simple, practical method makes it fun to learn Commercial Art, Cartooning and Designing AT HOME, in spare time.

Big Artist's Outfit Given

Drawing board, paints, brushes and all materials you need come with very first lessons. Actual fun learning to draw this way. Be an artist and make big money!

Send for FREE BOOK

Our big Free Book describes latest developments and wonderful opportunities in this fascinating field and gives full details of this simple, practical method. Tells all about our graduates—their successes—what they say—actual reproductions of their work—and how they earned big money even while learning. Mail coupon below or postcard today. State age. (No salesman will call.)

$76 a Week—that's what our student, H. J. A., of Penna., averages. Has made over $1200 in spare time!

$3000 for W. R. K.—of Newark, N. J. He writes that just two contracts brought him that neat sum!

$125 a WEEK J. R., of Syracuse, N. Y., writes: "Since completing your course I have earned as high as $125 a week."

Free Book shows how

Washington School of Art, Studio 201
1115—15th St., N. W., Washington, D. C.

Please send me, without obligation, your Free Book, "Art for Pleasure and Profit."

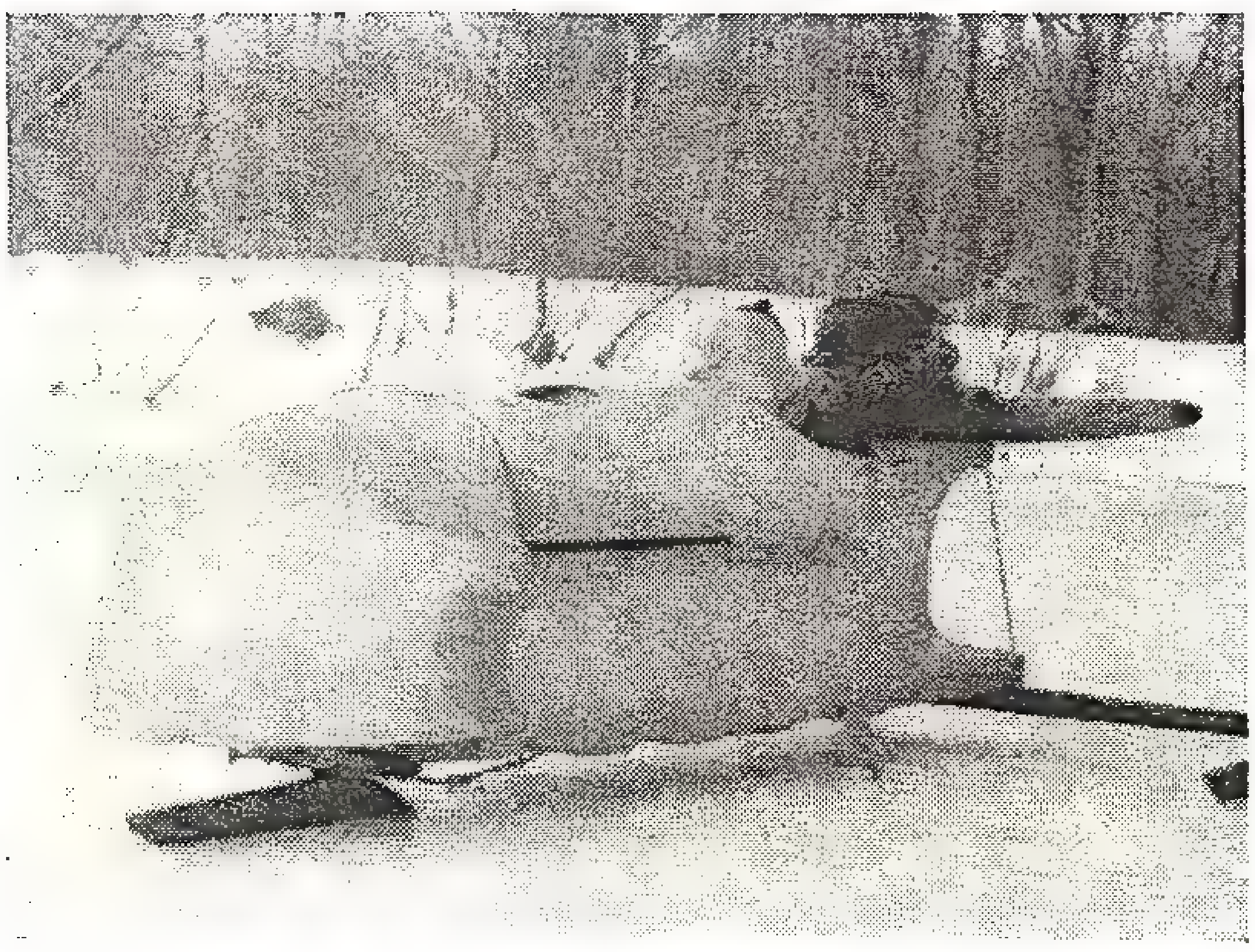
Name ------------------------------ Age--------

Address ------------------------------

City ------------------------------ State-----------

Editor's Workbench Chips

[*Continued from page* 25]



Powered by an old motorcycle engine and a small propeller, this snow-sled slides along at 62 m.p.h. Paul R. Bussler, Williamsport, Pa., built it from wood and sign painter's canvas.

favorite magazine. Here's a letter from an MM reader of long standing:

> Williamsport, Pa.
>
> Dear Editor:
>
> I'm sending the Workbench a photo of a snow-sled we built. It is made of wood except for the motor mount which is made of ¾-inch piping. The body frame is covered with sign canvas doped up with paint. The sled is powered with an old motorcycle engine and averages over 62 m.p.h.
>
> I would like to see some articles on gas-powered airplane models. I have been reading MM for over eight years and must say that there is no better magazine published.
>
> Paul R. Bussler.

Bussler's sled photo won a $3 prize. Send in photos and letters about your completed projects, readers. You may be awarded a prize, too.

The advice in our guest editorial this month is a summary of the advice which Mr. Emile F. du Pont gave originally in an address to the American Chemical Society, Division of Chemical Education, meeting in Pittsburgh. We believe it good advice to any sort of job aspirant.

Chemists have played a large part in the development of E. I. du Pont de Nemours & Co. The founder who started the business in 1902, was a chemist who had been an associate of Lavoisier. Of the firm's present 41,000 approximately 3,000 have had chemical training.

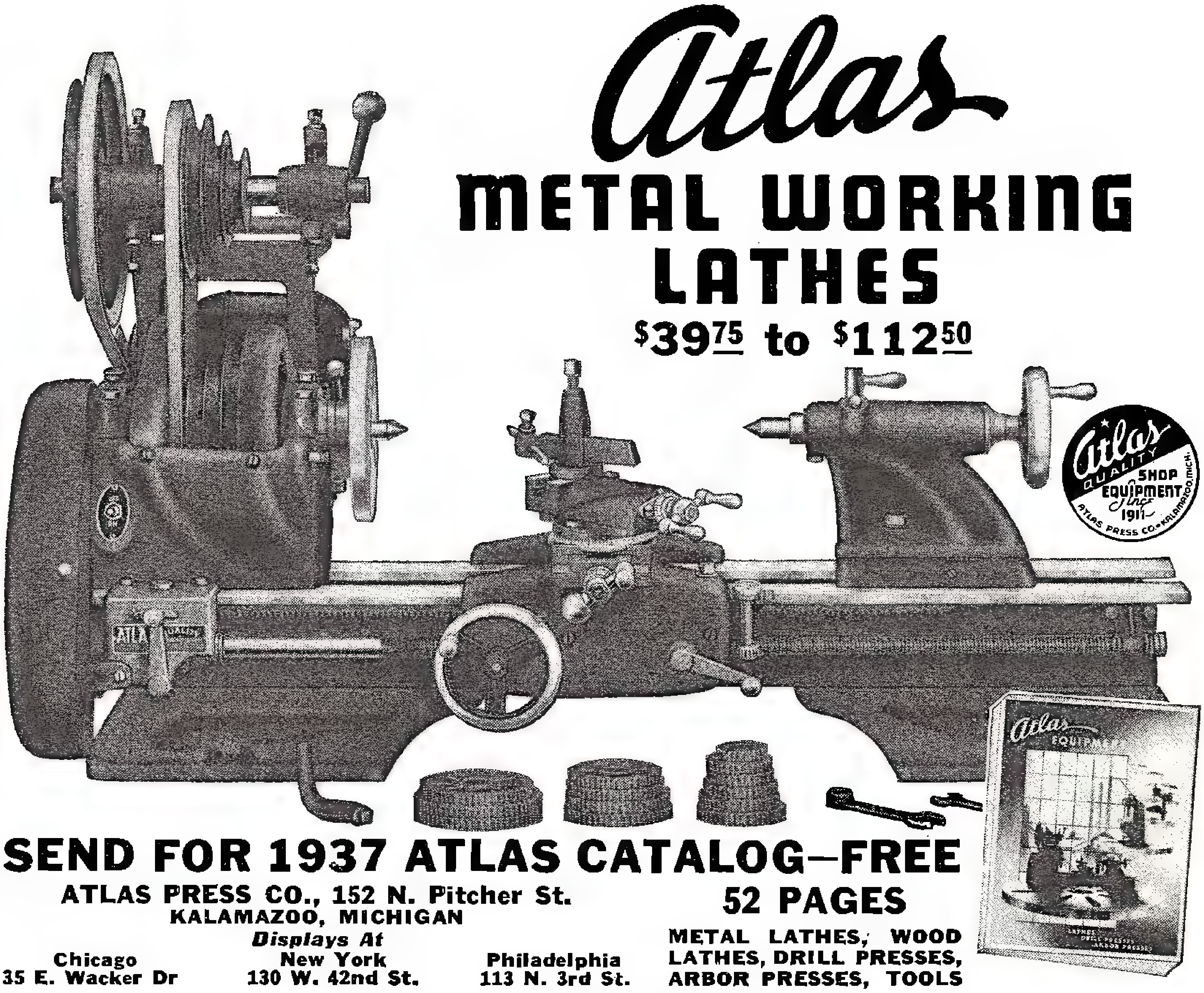
***

Readers in New England should listen to the Modern Mechanix Sunday radio programs over the Yankee network. Eight stations of the network and WINS, New York City, broadcast the program at Noon. It is repeated from WTIC, Hartford, Conn., at 1 p. m.

Atlas

METAL WORKING LATHES

$39.75 to $112.50



SEND FOR 1937 ATLAS CATALOG—FREE

ATLAS PRESS CO., 152 N. Pitcher St.
KALAMAZOO, MICHIGAN

Displays At

Chicago
35 E. Wacker Dr

New York
130 W. 42nd St.

Philadelphia
113 N. 3rd St.

52 PAGES

METAL LATHES, WOOD LATHES, DRILL PRESSES, ARBOR PRESSES, TOOLS

Be a RADIO EXPERT • Learn AT HOME

FREE

OF EXTRA COST

To start you making money without delay we equip you with this Circuit Analyzer and Point to Point Resistance Tester.

Be the ONE Man in 1000 Who Can Service Modern Sets!

Modern circuits stump the old-time cut-and-try radio fixer. More puzzling complications are coming. Trained men with up-to-the-minute radio knowledge are urgently needed to service these new receivers. Such men can make up to $3 an hour.

No Past Experience Needed

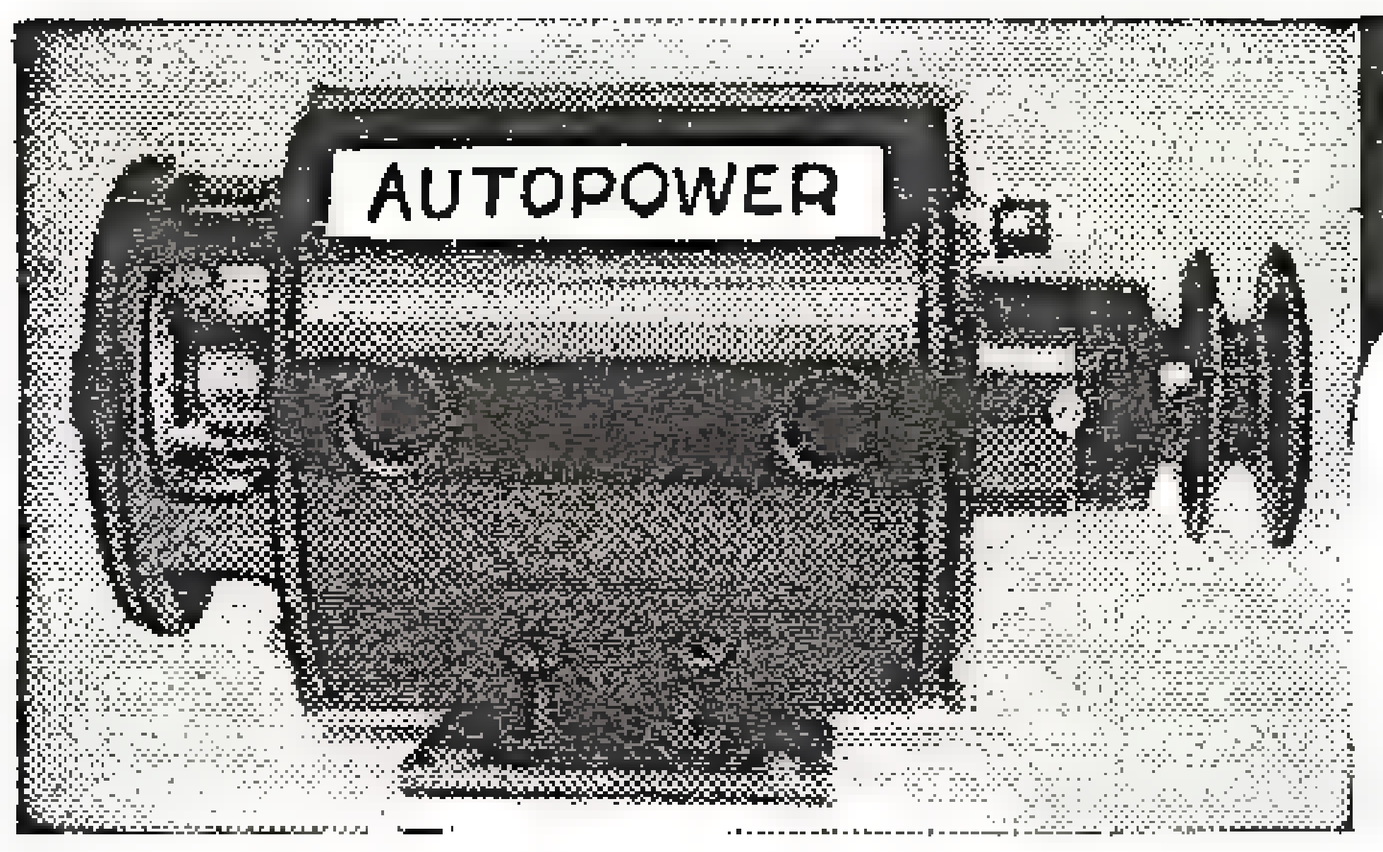
Past experience counts for little at this time because changes in radio design are so swift and radical. That's why you, as an R. T. A. Certified Radio-Technician can quickly work up into the big money class. Write today for full particulars.

What R. T. A. Graduates Say

Norwood, Ohio
I have connected with a large firm as Radio Service Manager and wish to extend my thanks for your help.
JOSEPH RAPIEN, JR.

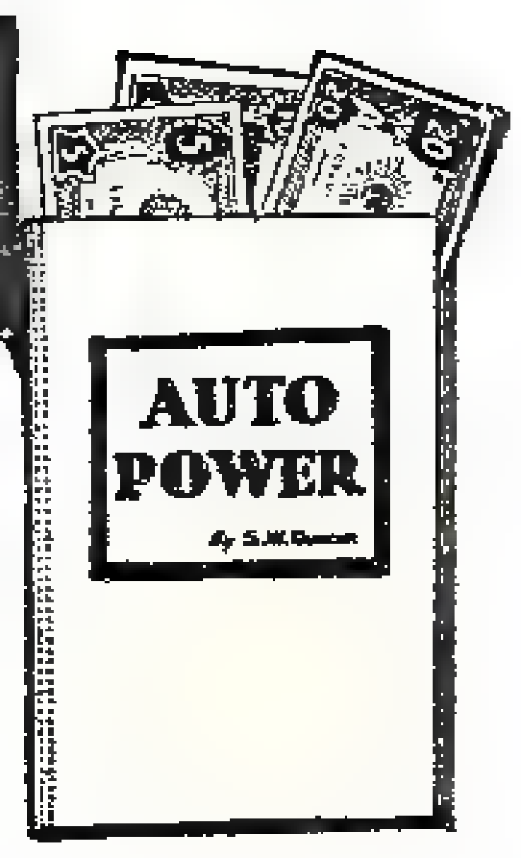
Ivanhoe, Virginia
Please rush the diploma to me at once. I am doing a good business in Radio, and I want to say again that I can't thank you enough for what you have done for me.
KOONTZ W. MARTIN

RADIO TRAINING ASSOCIATION OF AMERICA
Dept. MM-71, **4525 Ravenswood Avenue** **Chicago, Ill.**



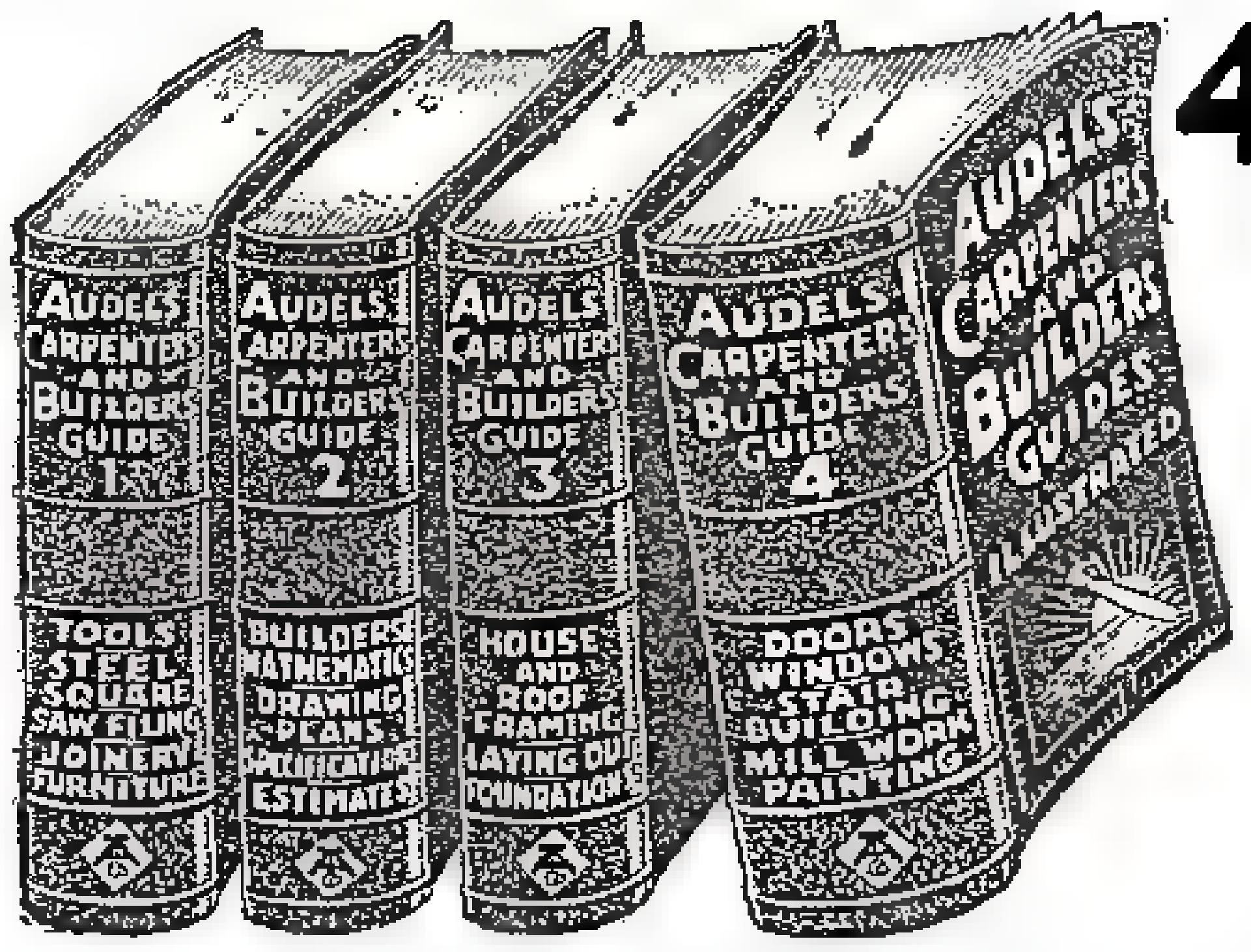
TURN SCRAP INTO MONEY

The new "1936" edition of "AUTOPOWER" with all the original specifications and many new ones is now off the press. The book is plainly written and illustrated—the instructions easy and simple. Change auto generators into practical A. C. and D. C. generators and motors with voltage from 2 to 1,000 volts, for power, light, welding, radio, sound, etc. No experience nor special tools needed to make these economical changes. Generators can be driven by wind, water, fan-belt, etc. $500 IN PRIZES GIVEN TO THE READERS OF "AUTOPOWER." Send for your copy today. Price only $1 postpaid.
AUTOPOWER, INC., Dept. 412-H, 412 S. Hoyne Ave., Chicago



AUDELS Carpenters and Builders Guides

4 vols. $6


AUDELS CARPENTERS AND BUILDERS GUIDE 1
AUDELS CARPENTERS AND BUILDERS GUIDE 2
AUDELS CARPENTERS AND BUILDERS GUIDE 3
AUDELS CARPENTERS AND BUILDERS GUIDE 4
AUDELS CARPENTERS AND BUILDERS GUIDES ILLUSTRATED
TOOLS STEEL SQUARE SAW FILING JOINERY FURNITURE
BUILDERS MATHEMATICS DRAWING PLANS SPECIFICATIONS ESTIMATES
HOUSE AND ROOF FRAMING LAYING OUT FOUNDATIONS
DOORS WINDOWS STAIR BUILDING MILL WORK PAINTING

Inside Trade Information for Carpenters, Builders, Joiners, Building Mechanics and all Woodworkers. These Guides give you the short-cut instructions that you want—including new methods, ideas, solutions, plans, systems and money saving suggestions. An easy progressive course for the apprentice and student. A practical daily helper and Quick Reference for the master worker. Carpenters everywhere are using these Guides as a Helping Hand to Easier Work, Better Work and Better Pay. To get this assistance for yourself, simply fill in and mail the FREE COUPON below.

Inside Trade Information On:

How to use the steel square—How to file and set saws—How to build furniture—How to use a mitre box—How to use the chalk line—How to use rules and scales—How to make joints—Carpenters arithmetic—Solving mensuration problems—Estimating strength of timbers—How to set girders and sills—How to frame houses and roofs—How to estimate costs—How to build houses, barns, garages, bungalows, etc.—How to read and draw plans—Drawing up specifications—How to excavate—How to use settings 12, 13 and 17 on the steel square—How to build hoists and scaffolds—skylights—How to build stairs—How to put on interior trim—How to hang doors—How to lath—lay floors—How to paint

THEO. AUDEL & CO., 49 W. 23rd St., New York City

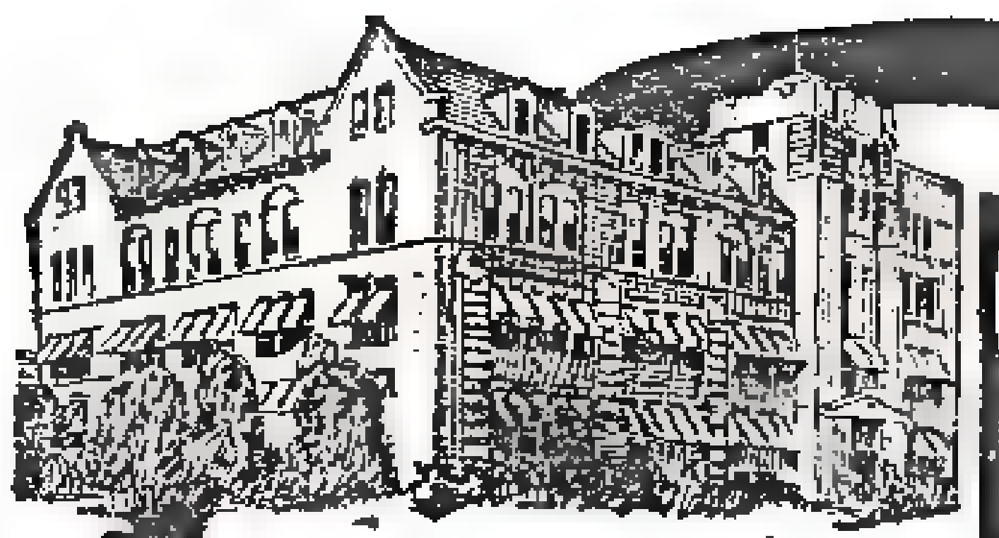
Mail Audels Carpenters and Builders Guides, 4 vols., on 7 days' free trial. If O.K. I will remit $1 in 7 days, and $1 monthly until $6 is paid. Otherwise I will return them. No obligation unless I am satisfied.

Name..

Address...

Occupation...

Reference.. M. M.



High School at Home

Many Finish in 2 Years

Go as rapidly as your time and abilities permit. Course equivalent to resident school work. During the past 14 years, our graduates have been admitted to 531 different Universities, Colleges, Junior Colleges and Normal Schools—80% of them without entrance examination. Also prepares for teacher's certificate and pre-professional examinations. *Meets all preparatory educational requirements for Business and Industry.* Standard H.S. texts supplied. Diploma. Credit for H. S. subjects already completed. Single subjects if desired. Tuition low as $5 monthly. Be a High School graduate. *Send for details NOW.*

20 Other Courses Specialized training is absolutely essential to Success today. Over 150 noted Educators, Engineers and Business Men helped prepare our special instruction material, used by many resident schools and colleges, U. S. Navy and Province of Manitoba, Can. Train at home for best-paying lines of Business and Industry, as listed in coupon below. No interference with present earnings while preparing for better job.

American School, Drexel at 58th, Chicago

Mail Coupon for Information—No Obligation

American School, Dept. H-128, Drexel at 58th, Chicago

Tell me how to train for success in line checked.

☐ High School Course in 2 Years

- ☐ Air Conditioning
- ☐ Architecture and Building
- ☐ Automotive Engineering
- ☐ Aviation
- ☐ Business Management
- ☐ Civil Engineering
- ☐ Complete Law
- ☐ Diesel Engineering
- ☐ Drafting and Design
- ☐ Electrical Engineering
- ☐ Electrical Refrigeration
- ☐ Highway Engineering
- ☐ Liberal Arts (College)
- ☐ Mechanical Engineering
- ☐ Private Secretary
- ☐ Professional Accounting Incl. C. P. A. Coaching
- ☐ Radio and Television
- ☐ Salesmanship
- ☐ Steam Engineering

Name..

Address...

STOP Your Rupture Worries!

C. E. Brooks, Inventor

Why worry and suffer any longer? Learn about our perfected invention for all forms of reducible rupture in men, women and children. Support fitted with automatic air cushion assists Nature in a natural strengthening of the weakened muscles. Thousands made happy. Weighs but a few ounces, is inconspicuous and sanitary. No stiff springs or hard pads. No salves or plasters. Durable, cheap. **Sent on trial** to prove it. Beware of imitations. Never sold in stores or by agents. Write today for full information and Free Book on Rupture. All correspondence confidential.

BROOKS COMPANY, 136-B State St., Marshall, Mich.

COLT 45 CAL. FRONTIER MODEL

Basswood construction kit with working plans and all necessary hardware. Barrel and cylinder are machined. **$1.45**

COLT 45 Cal. "FRONTIER" model kit, 4¾" barrel	$1.45
COLT 45 Cal. "FRONTIER" model kit, 5½" barrel	1.55
COLT 45 Cal. "FRONTIER" model kit, 7" barrel	1.70
COLT 45 Automatic Pistol kit	1.00

Postpaid in U. S. A.

GUN MODEL CO., Dept. D-21, 2908 N. Nordica Ave., Chicago, Ill.

SIGNS

The established, proven BIG MONEY field. Do you want easier work, leisure time, independence, a business for yourself, and $150 a week? Train quickly at home on actual work. New easy Picture-Way method of teaching makes experience unnecessary. You receive the personal attention of D. Rogers Stewart, the noted Artist-Instructor which makes this the finest instruction obtainable. Free placement service. FREE sign outfit. For FREE lesson, criticism, and information, write at once to:

STEWART SIGN SCHOOL, 3555 Aberdeen, Alton, Ill.

Low tuition. Enrollment limited.

1000 BARGAINS

AGENTS UNDERSELL STORES

Clothing, Dry Goods, Shoes, Notions, School Supplies, Novelties, Punch Boards, Razor Blades, Drug Sundries, Cosmetics, Perfumes, Food Products, Soaps, Carded Goods, Specialties, etc. Big Illustrated Catalog FREE.

RELIABLE JOBBERS

Dept. 113, 930 W. Roosevelt Rd. Chicago

AMAZING TELESCOPE VALUE

TESTED

40 POWER

$1.98

A PRICE SENSATION!

Only $1.98 for this powerful 5 section scientific instrument. AMERICAN MADE. 3 lenses in the eye-piece alone. See the rings of Saturn. Objects miles away brought right up to you. Can also be used as a powerful MICROSCOPE. POSTPAID. SEND ONLY $1.98. C. O. D. charges 24c extra.

NELSON LABORATORIES, Dept. X1, 505 Fifth Ave., New York

RADIOS

SAVE UP TO 50%

ALL NEW 1937 MODELS!

DEAL DIRECT—FACTORY PRICES!

Iron-Clad Written Guarantee!

A penny postcard brings you our new, full-color 16-page BARGAIN CATALOG free. Many models to choose from: 4 to 10 tubes; AC-DC, All-Wave and new Farm sets that operate like city radios!

30-DAY NO-RISK HOME TRIAL!

Send post card or coupon below for full details of our 30-day no-risk trial and Agent-User proposition!

$6.98

AGENTS! A real money-making offer. Write at once for territory!

NOW- **MAIL COUPON**

Free Catalog

GOLDENTONE RADIO CO., Dept. H, Dearborn, Mich. Without obligation, send me new 1937 Catalog and 30-day trial plan.

Name ------------------------------------

Address ---

BIG PAY DIESEL JOBS OPEN

Practical training all types Diesel engines

Diesel-electric and Diesel-hydraulic training

The Pacific Northwest, home of the Adcox School, is the "hot spot" of Diesel activity and a center of Diesel employment, offering countless opportunities for Diesel Experts. Every branch of Diesel industry is represented here including trucks, tractors, Diesel shovels, Diesel donkeys, Diesel motors in mines, large and small boats—it is probably unequaled by any other Diesel center in the world.

The Adcox School has been in business 27 years and is the most prominent school of its kind in the United States. Recommended by leading educational authorities as one of the finest practical trade schools in the world. Students from virtually every state including Alaska.

Study in the matchless climate of the Pacific Northwest. Enjoy numerous outdoor recreations such as fishing, hunting, hiking, sight-seeing, mountain climbing, swimming and other thrilling, healthful diversions.

Earn board and room while learning. You will find us friendly people here with a personal interest in your welfare and success, and fair treatment at all times. Adcox graduates located in all parts of the world. Remember, the best training pays best.

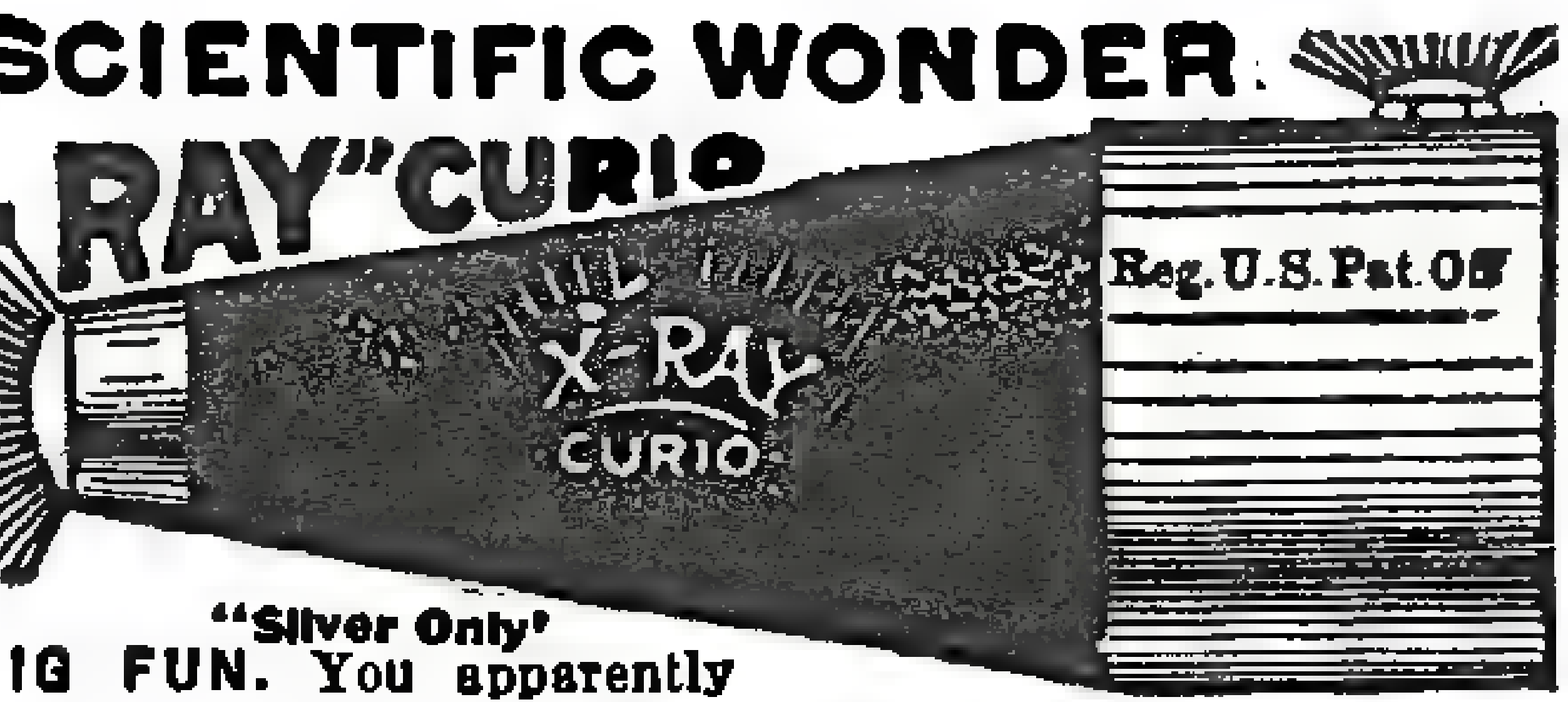
Before you choose a Diesel school carefully read valuable big, new, 40-page Adcox Diesel School Catalog No. 19-F—free on request while the present supply lasts.

DIESEL BOOK FREE

MR. L. L. ADCOX, President
L. L. ADCOX TRADE SCHOOL
237 N. E. Broadway, Portland, Ore.
Without obligation, please send FREE new, big 40-page Diesel School Catalog No. 19-F.

Name ____________________
Address ____________________
Town ____________________ State __________

NEW SCIENTIFIC WONDER
"X-RAY" CURIO



10c
3 for 25c

"Silver Only"

BOYS BIG FUN. You apparently see thru Clothes, Wood, Stone, any object. See Bones in Flesh. FREE PKG. radio picture films, takes pictures without camera. "You'll like 'em." 1 pkg. with each 25c order.

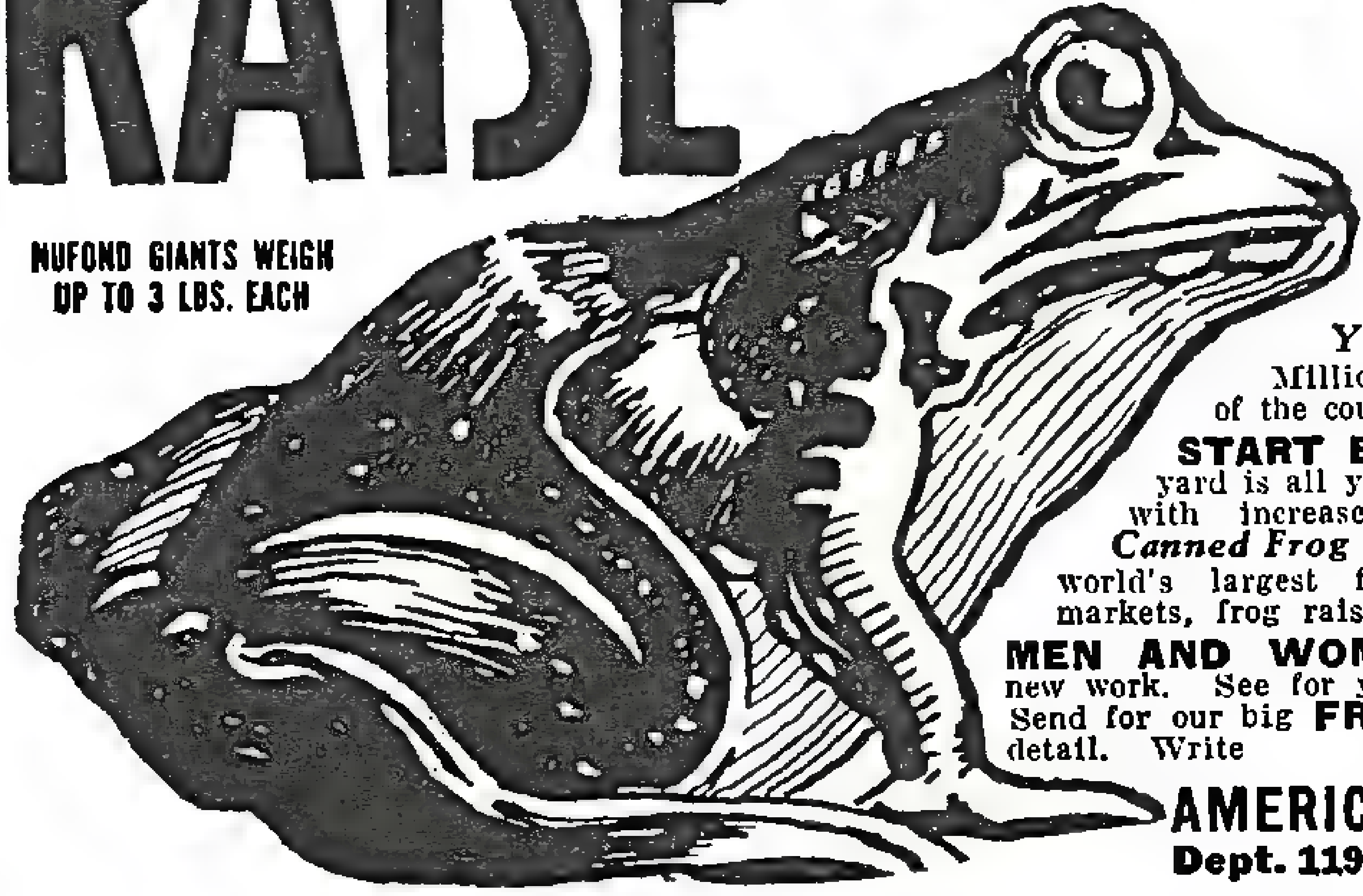
MARVEL MFG. CO., Dept. 86, NEW HAVEN, CONN.

WANTED BRANCH MANUFACTURERS

By old established firm, to cast Christmas goods, 5c and 10c Novelties, Toy Autos, Ashtrays, etc. Can be done in any spare room, basement or garage. No experience necessary as we furnish full instructions with moulds and small outlay starts you. A rare opportunity for these times, so if over 21 and you want to devote your spare or full time to profitable work write **AT ONCE** for full details as we are now closing arrangements for supply of our goods.

METAL CAST PRODUCTS CO.
1696 Boston Road, Dept. 2, New York, N. Y.

RAISE GIANT FROGS



NUFOND GIANTS WEIGH UP TO 3 LBS. EACH

SELL UP TO $5 PER DOZEN!

Pair of breeders may lay *10,000 Eggs Yearly!* Prices steady. Markets waiting. Millions used yearly! Easy to ship to any part of the country. Nation-wide market at your command. **START BACKYARD!** Small pond in your backyard is all you need for five pairs of breeders. Expand with increase. **WE BUY!** As originators of *Canned Frog Legs*, we are developing one of the world's largest frog markets. In addition to other markets, frog raisers can also ship to us. **MEN AND WOMEN!** Investigate this interesting, new work. See for yourself what others are already doing. Send for our big **FREE** frog book explaining our offer in detail. Write

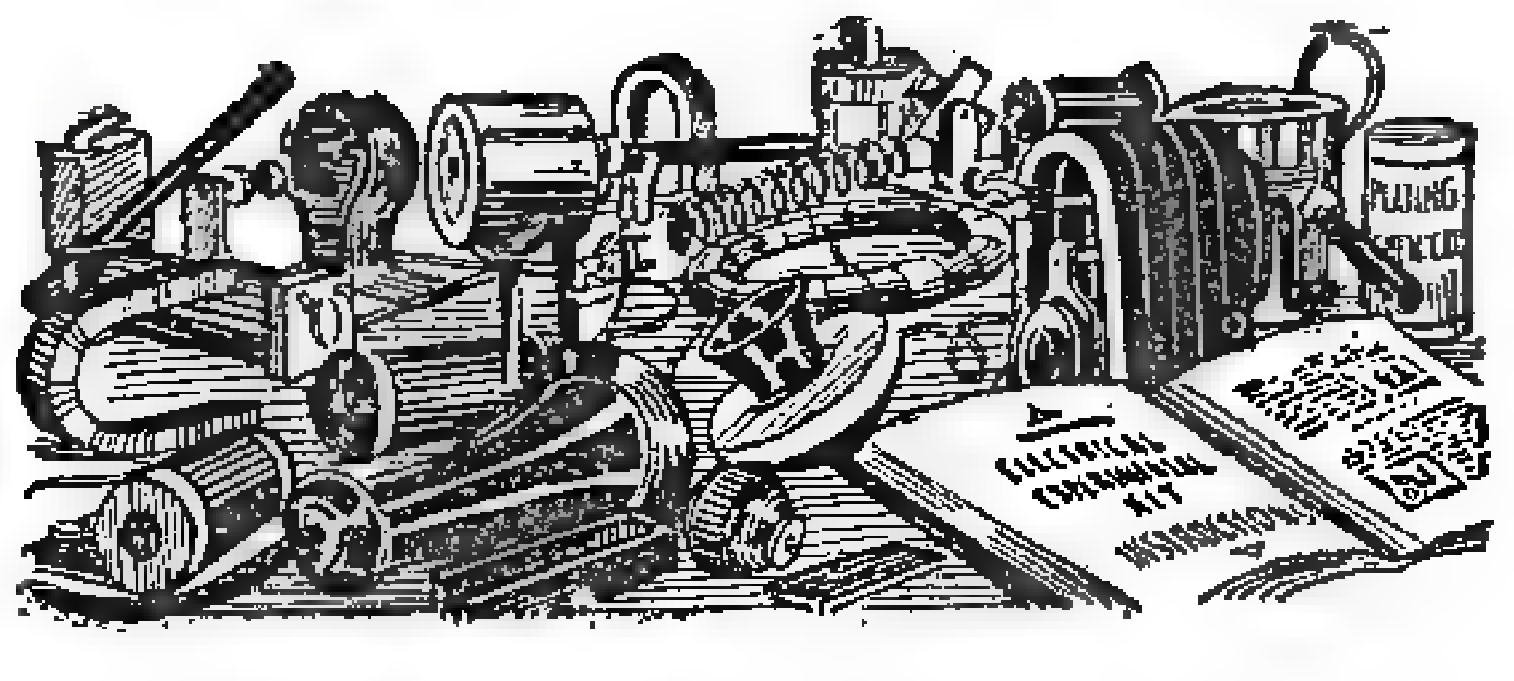
AMERICAN FROG CANNING CO.
Dept. 119-A New Orleans, La.

FREE BOOK

A Future in Frogs

Boys! Men! Get This Wonderful **XMAS GIFT!**

25 PIECE ELECTRICAL EXPERIMENTAL KIT



WIRE UP thief detector, extension phone, electric welder, radio code set, electro-plating, arc furnace, circuit tester, 110-volt rectifier, 110-volt motor, hundreds of fascinating experiments.

CONSTRUCT arc light 4,000-ft. range, secret service phone (listen on private conversations), generate ultra violet (sun tan) health rays, make real electric stove, etc. Thrilling and educational experiments.

Arc Kit
4000 ft. Range

AMAZING VALUE!

Works from house light current. Weld iron or brass. Melt glass, metal. Make arc light (1 mile range.) Arc furnace. Generate sun-tan rays. Consists of arc holder, stand, carbons, power coils, cord, plug, etc. Special goggles. Experiment book free. (List price, $4.75.)
SPECIAL - - - $1.49

Motor Transformer Kit

Make scores of thrilling A. C. experiments. Free book shows how. Make motor, transformer, elec. hammer, floating ring, step-down transformer, stroboscope, etc. 100 laminations, mounted rotor, pulley, wire, cord, plug, lamp, coils, etc. List $6.
SPECIAL - - - - - - - - $2.87

25 Pieces Genuine Commercial Apparatus
NOT TOYS—but real apparatus purchased from surplus and bankrupt stocks. Kit contains 110-volt A. C. power motor, sensitive microphone, transformer, polarized test receiver, arc carbons, electro-magnet, test compass, plating chemicals, condenser, secret service transmitter, powerful magnet, plating anodes, test socket, 110-volt power reducer, test cord and clips—12 other valuable pieces. Complete illustrated experimental manual furnished.

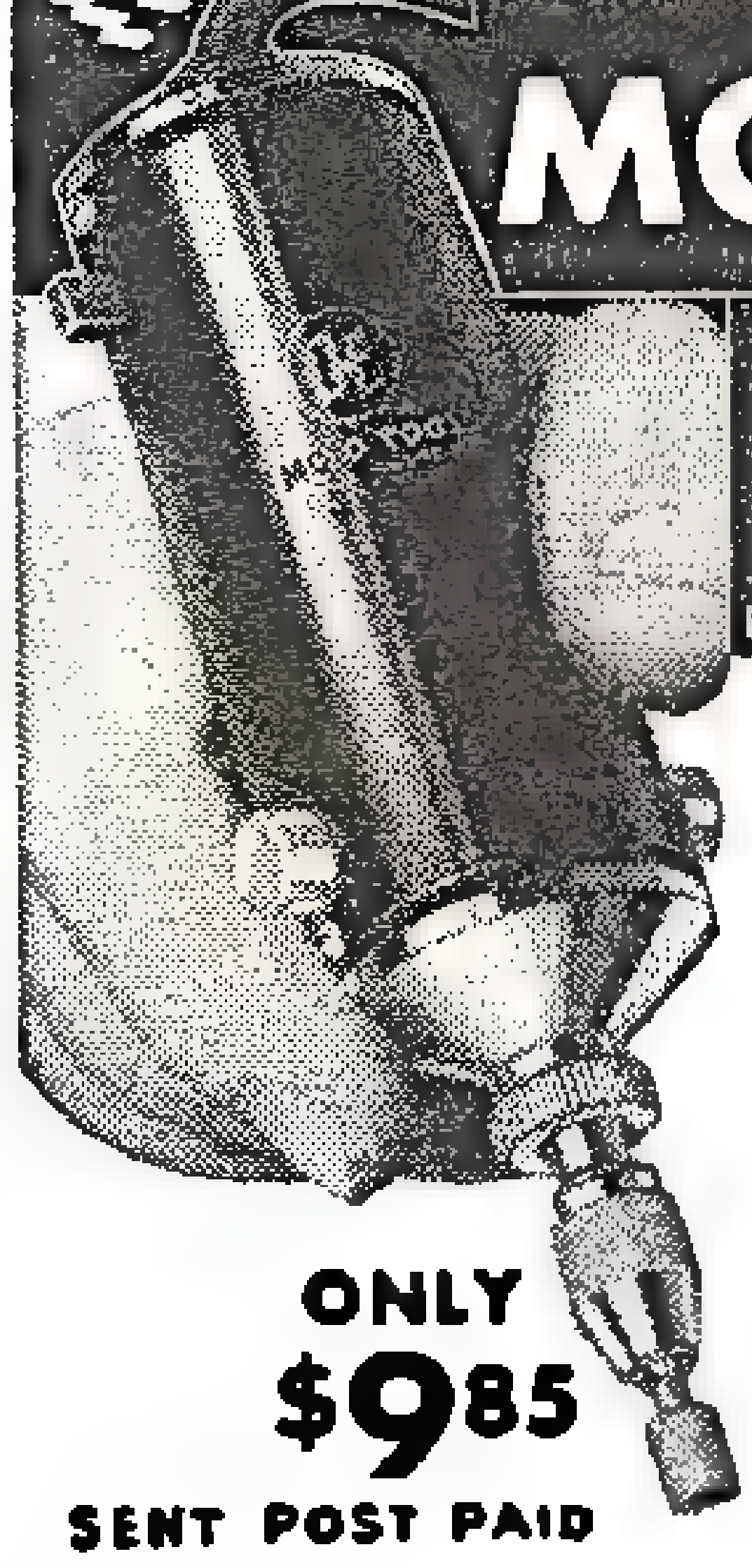
Original List Price of Parts - - - - $18.50

Orders shipped same day received Only $3.99

FREE 3 Manuals—1. Short Course in Electricity and Radio. 2. Blue Prints and Plans for Home Laboratory. 3. Fun with Electricity. Send stamp for Electrical, Radio and Tool Bargain Catalog. ORDER TODAY!

ELECTRICAL SALVAGE CO.
Box 524-A10, Lincoln, Nebr.

ALL PURPOSE MOTO-TOOL



10 DAY MONEY BACK TRIAL

for Home—Shop—School—Profession

Grinds, drills, engraves, routes, carves, sharpens, polishes and does hundreds of jobs quicker, better and with greater precision. Handles easily as a pencil—weighs only six ounces, and is amazingly powerful. 110-Volt Universal Motor—about 20,000 r.p.m.—oilless self-aligning ball thrust bearings. Handy built-in switch. Easily replaceable brushes. Universal Collet Chuck. Bakelite housing. **You must see and use it to appreciate its tremendous value.**

Order on 10-day trial. Money refunded if not more than satisfied. **BOOKLET FREE.** 20-piece Craftsman's Tool Set for all types of Moto-Tool work, $5.75.

ONLY $9.85
SENT POST PAID

DREMEL MANUFACTURING CO.
1013-CT, Racine, Wisconsin

SPECIALS—AIR PISTOLS & RIFLES

100 Shot Repeater HAENEL AIR PISTOL

$3.95

No license, powder or pumping. For target practice, small game, rats, etc. Well made, strong, powerful, easy loading; heavy metal, wood stocks. 7 in. overall; wt. 1 lb. 500 **steel BB's FREE.** Special $3.95. Extra Steel Shot, 35c per 500. **Holsters for Model 100**____75c
Keenfire, single shot 200 BB's, Darts, Target__**$2.00**
HAENEL Hi-Power Mod. 26; rifled; 177 cal. accurate hard shooting; 500 Pellets Free__________**$6.95**
Crosman Air Rifles, 22 cal. Single—$8.45
Repeater ____________________________**$10.95**
Benjamin Air Rifles, Single Shot $5.45; Repeater____________**$6.95**
Benjamin Air Pistols, 177 and 22 cal. hi-power____________**$6.95**
500 Pellets—177—60c; 22—75c; Darts 177—25c; 22 cal.—35c doz. New bargain Catalog. Rifles, Firearms, Binoculars, Telescopes, Microscopes, Knives, Holsters, etc. Send stamp. $2 Deposit required on C. O. D. Send M. O. in full and save C. O. D. charges.
LEE SALES CO. **(Dept. M)** **35 West 32nd St.** **New York City**

TRAIN FOR Radio 12 Weeks SHOP TRAINING

EASY PAYMENT PLAN

GET DETAILS of MY AMAZING OFFER!

Prepare for jobs in Radio Broadcast, **Talking Pictures, Television, by twelve weeks of practical shop work** in the great Coyne Radio Shops, on real machinery and equipment. You don't need advanced education or experience. Free Employment Service for life. **Many earn while learning. Mail coupon today** for free book which tells you how hundreds have become successful Radio men after getting a training and all details of my **"Pay Tuition After Graduation" Plan.**

H. C. LEWIS, Pres., COYNE RADIO SCHOOL
500 S. Paulina Street., Dept. 17-1H Chicago, Ill.

Send Free Radio Book and facts. **Tell how I can pay for my course on easy payment plan after getting my 12 weeks' training.**

Name ....
Address ....
Town.............................*State*..........

WILL YOU WEAR THIS SUIT

and Make up to $12 in a Day!

Let me send you this fine all-wool tailored suit **FREE OF COST.** Just follow my easy plan and show the suit to your friends. Make up to $12 in a day easily. **No experience—no canvassing necessary.**

Send for Samples—FREE OF COST

Write today for FREE details, ACTUAL SAMPLES and "sure-fire" money getting plans. Send no money.
H. J. Collins, Progress Tailoring Co., Dept. N-137
500 S. Throop St. **Chicago, Ill.**

BECOME A SUCCESSFUL
DETECTIVE

Earn Big Money—Travel or Work at Home. Train Yourself for Secret Investigation and Confidential Work by Our Easy Home-Study Methods. If You Are 17 or Over Write for Free Detective Paper and Interesting Literature.

NATIONAL DETECTIVE SYSTEM
Dept. D Fremont, Nebraska

$ NEED MONEY?

Write for free booklet describing "107 Plans for Operating a Successful Business of Your Own". Make from $20 to $100 a week starting in spare time at home. No peddling or house-to-house selling. Booklet sent *free,* and *without obligation.* Write for your copy *today.*

ELITE PUBLISHING CO.
Dept. G 214 Grand St. New York, N. Y.

FREE BOOK

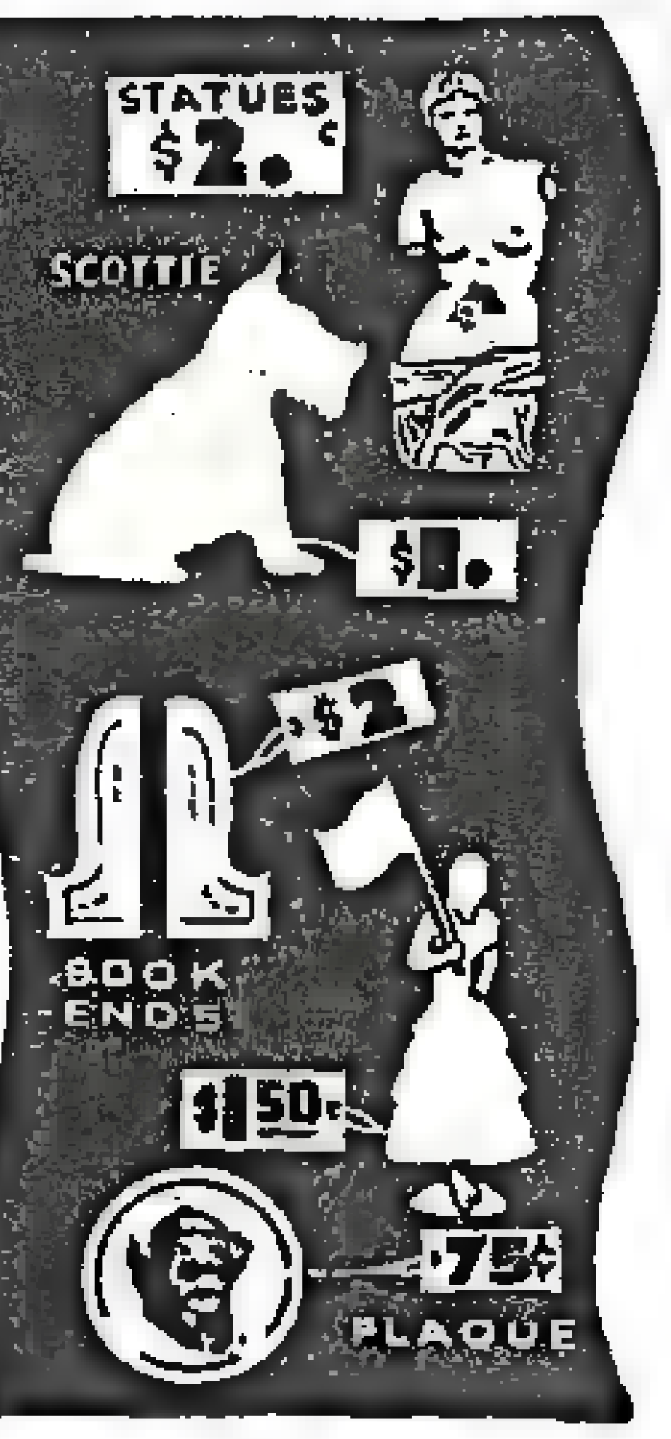
AVIATION

APPRENTICES

Ambitious, air-minded young man, interested in entering the well paid field of Aviation, write immediately, enclosing stamp, to

MECHANIX UNIVERSAL AVIATION SERVICE
Incorporated
Strathmoor Station **Dept. A** **Detroit, Michigan**

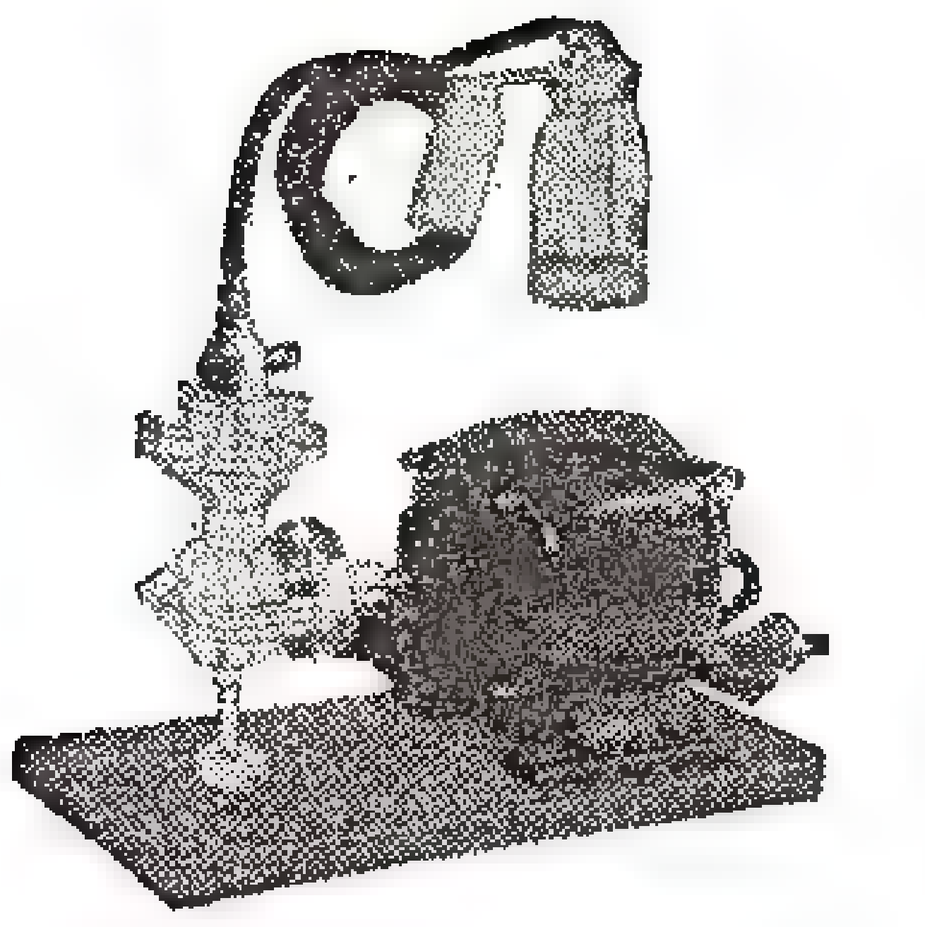
***NOW*—Make These Attractive Ornaments and Gifts at Home and EARN BIG PROFITS!**



RUBBER MOLDS
AS LOW AS 6c EACH!

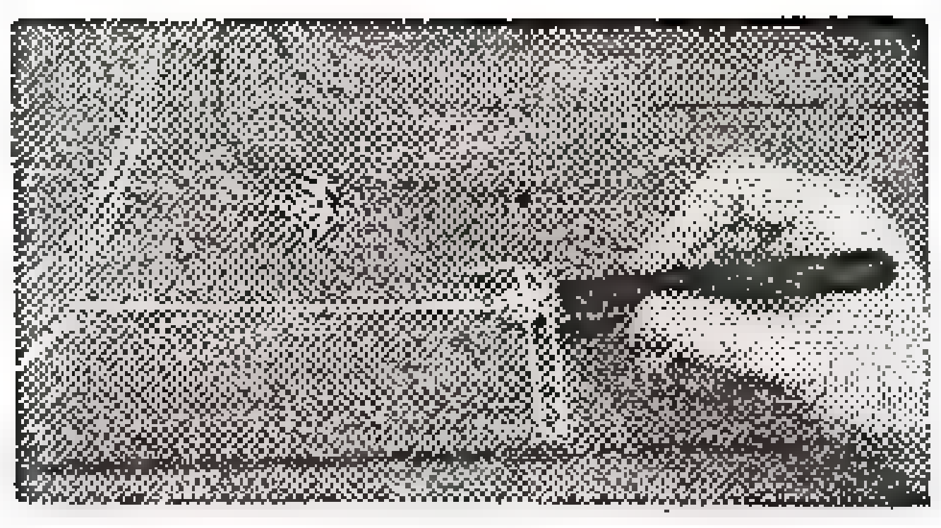
Amazing rubber mold-making outfit makes perfect molds of plaques, medallions, statues, busts of famous men and women, ash trays, bookends, etc., from 6c to 25c each. One mold makes dozens of novelties and gifts to sell for $1.00 or more apiece! No experience necessary. Everything furnished—complete instructions. Start profitable business in your home . . . sell to stores, friends, neighbors, by mail. Make BIG MONEY full or spare time with SO-LO GO-MA. Write for complete FREE details and sensational introductory offer.

SO-LO GO-MA MOLD CO.
Dept. K-834, **Cincinnati, O.**



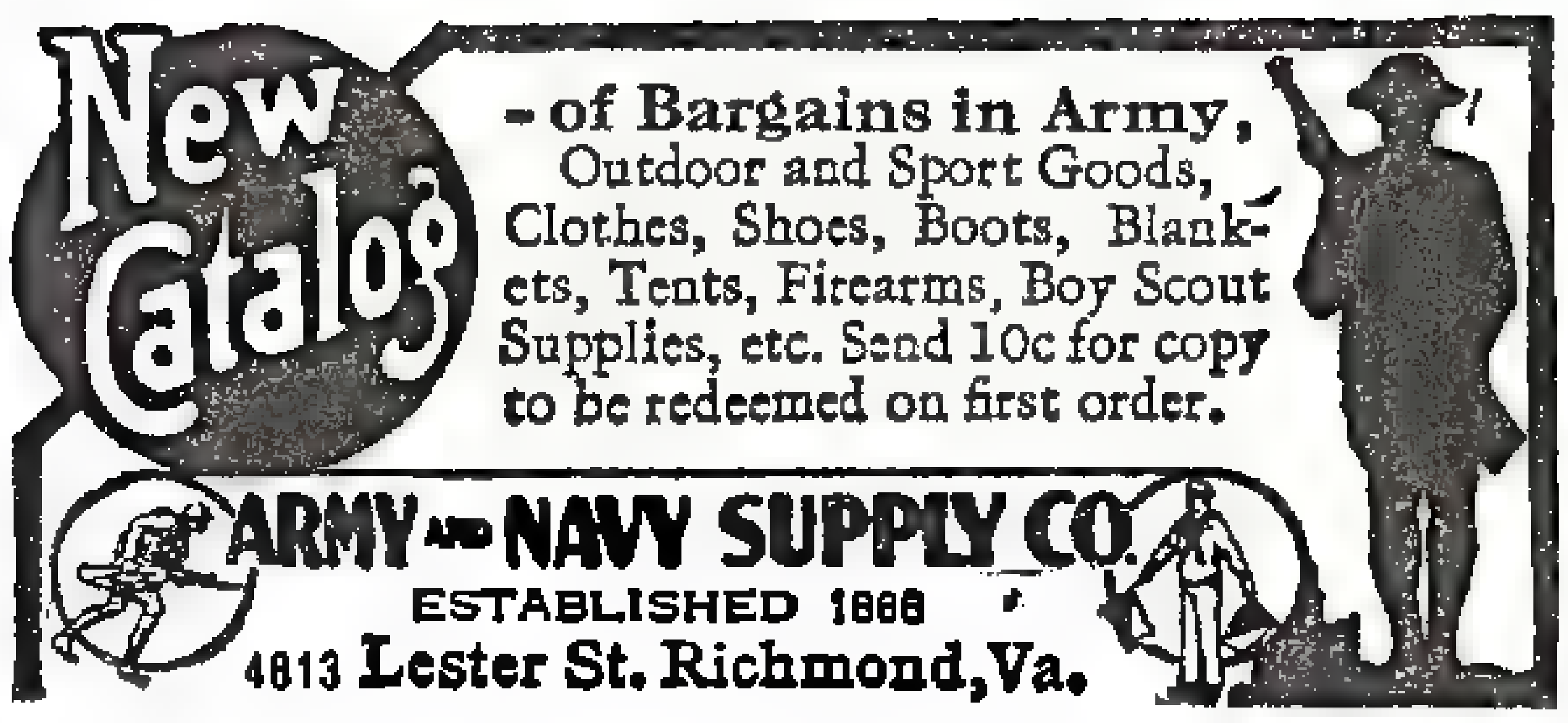
PAINT SPRAY UNIT *only* $5.95

Suction feed gun, nozzle fine round shading spray to full round. Handles paint, varnish, lacquer, etc. For mothproofing, etc. Paints anything. Fine for "hard to get at places". Uses ¼ H.P. motor which is not included. Complete with clean air compressor, 8 ft. air hose, tire chuck, spray gun and all mounting only $5.95. Send only $1.00. Bal. C. O. D. Others up to $19.00 complete.



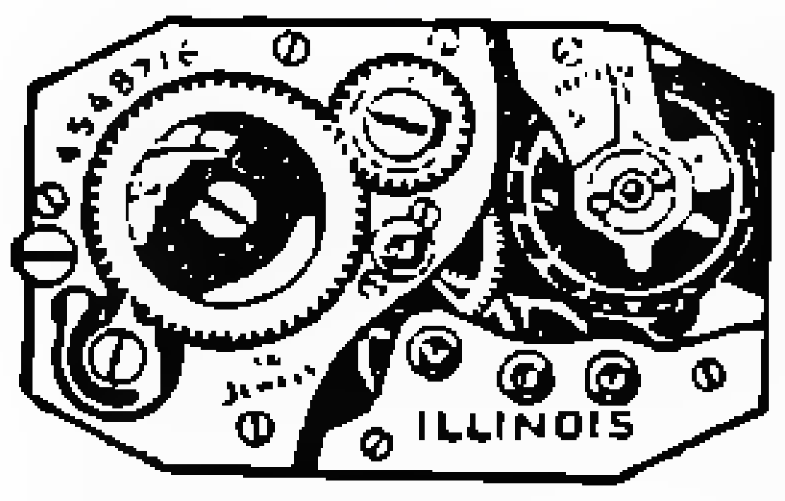
STRIPE YOUR OWN CAR with a ROLL-A-STRIPE. Save the price of your striping job and earn money doing others. Special knurled roller, dependable gauge. Uses paint, lacquer. enamel, varnish or heavy ink. Stripe signs, furniture, models, etc. Send for one today. Postpaid $1.50.

MODCRAFT INDUSTRIES, Dept. D-21, 2908 N Nordica Ave., CHICAGO, ILL.



New Catalog - of Bargains in Army, Outdoor and Sport Goods, Clothes, Shoes, Boots, Blankets, Tents, Firearms, Boy Scout Supplies, etc. Send 10c for copy to be redeemed on first order.

ARMY AND NAVY SUPPLY CO.
ESTABLISHED 1868
4813 Lester St. Richmond, Va.



SOLVE the Mystery of Watches and Clocks

with our kit of *genuine* watchmaker's tools. "Get a KICK learning what makes them TICK"! Kit can also be used by machinists, mechanics, electricians, etc. KIT $2.00. Watch Movement 50c postpaid. Distributors, Agents and Dealers write ONTYME WATCH COMPANY, Dept. B, P. O. Box 999, Chicago, Ill.

SAVE MONEY ON YOUR TRAILERS $1

Send a dollar for Trailer Designers' Guide Book. It includes 8 distinctively different designs of trailers, their descriptions and floor plans. A simplified model No. 800 with assembly plans, sections, details, underbody sheet and stock list, including bolts and screws, building instructions, suggestions as to what to invent for trailers, drawings of doors and windows, and how to build them. A variety of color sketches, trailer balancing instructions, etc. Mail a dollar today for this large book.

D. VAN OOSTVELDT, 111 Marston, Dept. 33, Detroit, Mich.

NOBOSS! SURE CASH! START OWN BUSINESS

Resilvering mirrors. Replating tableware, reflectors. Refinishing chandeliers. Making Chipped Glass Signs. Experience unnecessary. Combination outfit furnished. Write—SPRINKLE, Plater, 855, Marion, Indiana.

A Salary in Your Cellar!

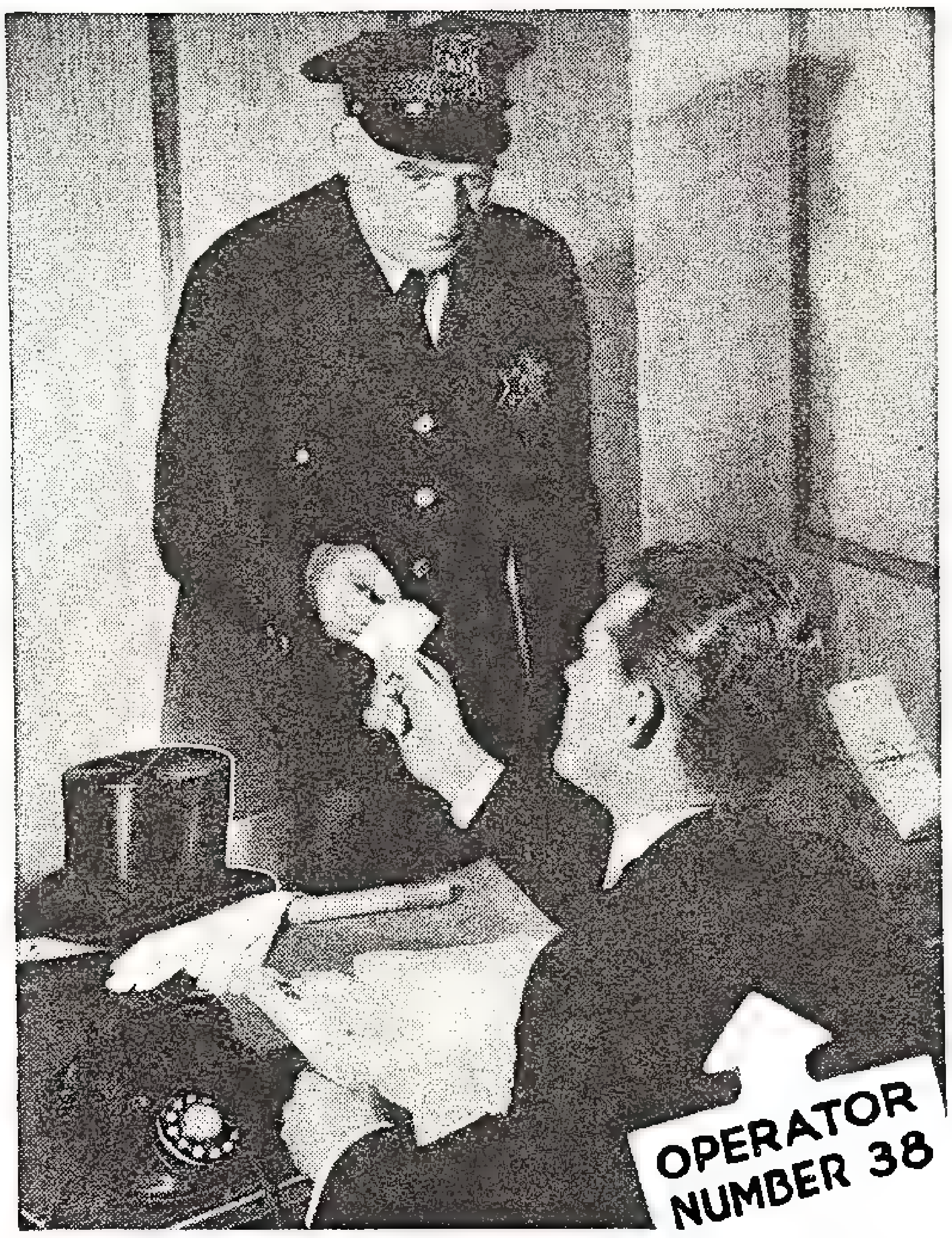
MONEY in MUSHROOMS

Grow Mushrooms in cellar, shed. Exclusive new process. Bigger, better, quicker crops. More money for you! Start now, for best results. We buy mushrooms. Book free.

AMERICAN MUSHROOM INDUSTRIES, LTD., Dept. 786, Toronto, Ont.

Arrest Him, Officer!

I'LL HAVE COMPLETE FACTS ON THE OTHER FELLOW TONIGHT!



Follow This Man!

SECRET Service Operator No. 38 is on the job . . . *follow him* through all the excitement of his chase after the counterfeit gang. See how a crafty operator works. Tell-tale finger prints in the murdered girl's room that help him solve the great mystery! BETTER than fiction because every word is TRUE. No obligation. Just mail me the coupon and get—

FREE The Confidential Reports No. 38 Made to His Chief

And the best part of it all is this—it may open your eyes to the great opportunity for YOU as a well paid Finger Print Expert. This is a young, *fast-growing* profession. The kind of work you would like. Excitement! Thrills! Travel! *A regular monthly salary.* Reward money. *And remember:* graduates of this school HEAD 47% of *all* Identification Bureaus in the U. S. Quick! Mail the Coupon NOW and I'll send you these Free Confidential Reports!

INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave., Dept. 2351, Chicago, Illinois

Institute of Applied Science
1920 Sunnyside Ave., Dept. 2351, Chicago, Illinois

Gentlemen:—Without any obligation whatsoever, send me the Reports of Operator No. 38, also your illustrated Free Book on Finger Prints and your low prices and Easy Terms Offer. Literature will NOT be sent to boys under 17 years of age.

Name ....

Address ....

.... *Age* ....

TRAIN NOW for QUICK SUCCESS in

DIESEL and GAS Engineering

LEARN IN SPARE TIME

EARN EXTRA $ MONEY $

Raise Your Pay with "Job-Way"

Are you tired of lay-offs and low pay? Do you really want to get into a business that offers good pay, and a real future? Then you want "Job-Way" Training—the training that has started thousands on the road to success.

Good Jobs — Great Opportunities

Rapid growth of Auto industry has created countless opportunities for trained service and repair men. And now, Diesel—the new cheap power for trucks, buses, tractors, engines—has opened up still greater fields of power development.

Combined Auto-Diesel Training

"Job-Way" alone gives you **combined** Diesel and Auto Training by a practical, easy method of home study and actual job work. Thousands of our students have more than paid for their training thru our exclusive spare-time money plan.

Mail Coupon for Free Book

If you want big pay and want it quick, rush the coupon TODAY for FREE AUTO-DIESEL BOOK, with full facts about "Job-Way" Training, Free Employment Service, Free Motor Testing Equipment, liberal Pay-As-You Learn Plan, and positive Money-Back Agreement.

MOTOR INSTITUTE of AMERICA
Dept. AA-13, Chicago, Illinois

SEND NOW for FREE Book

D. F. GELLER, Pres., MOTOR INSTITUTE
4554 Broadway, Dept AA-13, Chicago, Illinois

Without obligating me, send Free Auto-Diesel Book, with full details of "Job-Way" Training and "Pay-As-You-Learn" Offer.

Name..
Address..
*City*______________________*State*____________

TELLS HOW

"The Stanley Tool Guide", tells how to use and care for tools. How to sharpen edge tools. How to make common cuts and joints in wood. Hundreds of helpful illustrations. 32 big pages.

The STANLEY TOOL GUIDE

25c

TELLS WHAT

"Things To Make In Your Homeworkshop" — 16 complete plans for making useful articles — detailed plans and list of stock required for each project.

10c

Send coin or stamps today for one or both of these helpful books

STANLEY TOOLS
108 Elm St.
New Britain, Conn.

New POCKET RADIO

MUSIC SPORTS ENTERTAINMENT

FITS POCKET EASILY—*Take it with you!*

Brings in stations with beautiful clear loud tone! Incorporates such features as direct reception from radio — no dangling phones to bother with — single centralized tuning which is the only moving part — covers broadcast band, etc. You should be thrilled with its excellent performance. Complete in one unit, just like the big sets—but weighs only 6 ozs. Requires no batteries, tubes or electrical connections.

Costs Nothing to Operate—Nothing Else to Buy! Comes to you complete, all ready to listen, with simple instructions for use in hotel, camps, office, home, picnics, bed, boats, etc., and take it with you while traveling, in autos, bicycles, etc. Works immediately. Nothing to adjust. No difficult hook-ups. Should last for years. A GUARANTEED Radio.

SEND NO MONEY! Sent C. O. D. or send money with order. Get the "Cathedral" Radio today—the radio that combines performance—economy—and practicability. Comes in beautiful walnut color with built-in phone and attractive tone grille in upper part of radio. Order now! Be the first to have one. Pay postman on arrival only $2.99 and few pennies postage.

Mighty Midget Radio Co., 1951 Irving Park Blvd., Dept. 602, Chicago

PLAY PIANO 1st DAY

With my new AMAZINGLY simple easy-to-learn 20 lesson course you really PLAY piano the first day. Then rapid progress, popularity, admiring friends, orchestra jobs. Results assured. Send now, 1st four lessons $1. Complete course $5. MUSICALLY correct. Satisfaction or your money back. START NOW.

HAMILTON MUSIC METHODS
5757 N. Merrimac Ave., MM, Chicago, Ill.

SHIP MODEL FITTINGS

Build the Mayflower

Construction sets, fittings and blueprints for all popular models. We manufacture the largest and finest line of fittings for sailing ships, battleships, destroyers, whaleships, motorboats, Marblehead (50-800) and Class A racing yachts in the U. S. A. Send 15c to-day for our 40-page illustrated catalog.

A. J. FISHER
1002-5 Etowah Ave. Royal Oak, Mich.

MAN IN EACH TOWN

To Plate Auto Parts, Reflectors, Bathroom Fixtures, Refinish Beds, Mirrors, Chandeliers, by late method. Experience unnecessary. Simple plan of manufacturing at home starts you in big money making business. Free particulars and proofs. Write today.

GUNMETAL CO. Ave. P Decatur, Ill.

ONE-MAN SAWMILL FARM MODEL $49

TURN TREES INTO MONEY WITH A BELSAW!

Makes lumber, shingles, lath, ties, crates, boxes, cases, all forms lumber

Three capacities: 10, 14 and 20 feet. Accurate set works, positive dogs. Full or one-way type power feed runs on low power—many owners use old auto engine. Pays for itself quickly—thousands in commercial service, everywhere. Write for free lumber handbook and catalog of mills, supplies, tools, saw tables, and woodworking equipment.

BELSAW MACHINERY CO.
834-G Davidson Bldg., Kansas City, Mo.

No JOKE TO BE DEAF

—Every deaf person knows that—

Mr. Way made himself hear his watch tick after being deaf for twenty-five years, with his Artificial Ear Drums. He wore them day and night. They stopped his head noises. They are invisible and comfortable, no wires or batteries. Write for TRUE STORY. Also booklet on Deafness.

Artificial Ear Drum

THE WAY COMPANY
741 Hofmann Bldg. Detroit, Michigan

Learn Photography at HOME

Splendid opportunities. Prepare quickly in spare time. Easy method. No previous experience necessary, common school education sufficient. Many earn while learning. Send for free booklet "Opportunities in Modern Photography", particulars and requirements.

AMERICAN SCHOOL OF PHOTOGRAPHY
3601 Michigan Avenue Dept. 2051 Chicago, Illinois

New-TYPE Cheap OIL BURNER INVENTED

Sweeping the Country!

COOK and HEAT Without Coal or Wood

In Your Present Stove or Furnace—
HOTTER—CHEAPER—No Dirt or Ashes — Twice the Heat Quick at HALF THE COST.

COOKS A MEAL for LESS

Beats any oil burner ever gotten out for low cost, perfect performance. Burns cheap oil a new way, without pre-generating or clogging up. Quick intense heat **by Simple Turn of Valve.**

Try At Our Risk

30 DAYS' TRIAL

Prove it ends drudgery and dirt of coal or wood; cuts fuel bills in half, pays for itself quickly by what IT SAVES.

FREE SAMPLE FOR AGENTS

offered to one energetic man or woman in each locality who will demonstrate and take orders. Write quick, be first to learn how to make REAL MONEY right now. spare or full time—mail 1c postcard today.

AGENTS
Salesmen
BIG MONEY
Drop Everything for this Quick Seller. Clark of Ind., sold 33 in 20 days. Get YOUR OWN oil burner FREE and make REAL Money. Write now.

Slips Into Any STOVE, RANGE or FURNACE

Quick HEAT at Turn of Valve!

UNITED FACTORIES, A-600 Factory Bldg., Kansas City, Mo.

AMATEUR CARTOONISTS WIN $25.00

Wanted—Amateurs with humorous ideas. No drawing ability necessary. The amateurs of today are the professional cartoonists of tomorrow. Ideas judged and prizes awarded by Applause-O-Meter test before movie audiences. Everyone has an equal chance. 26 cash prizes in all. Rush name on post card for "Valuable Tips on How to Make Money With Simple Cartoons and Humorous Ideas," Cash Prize Entry Blank and Rules—Send No Money.

CARTOONISTS' EXCHANGE, Dept. 351, Pleasant Hill, Ohio

RADIO BUILDERS' MANUAL

148 Pages

Over 500 Pictures

RADIO BUILDERS' MANUAL

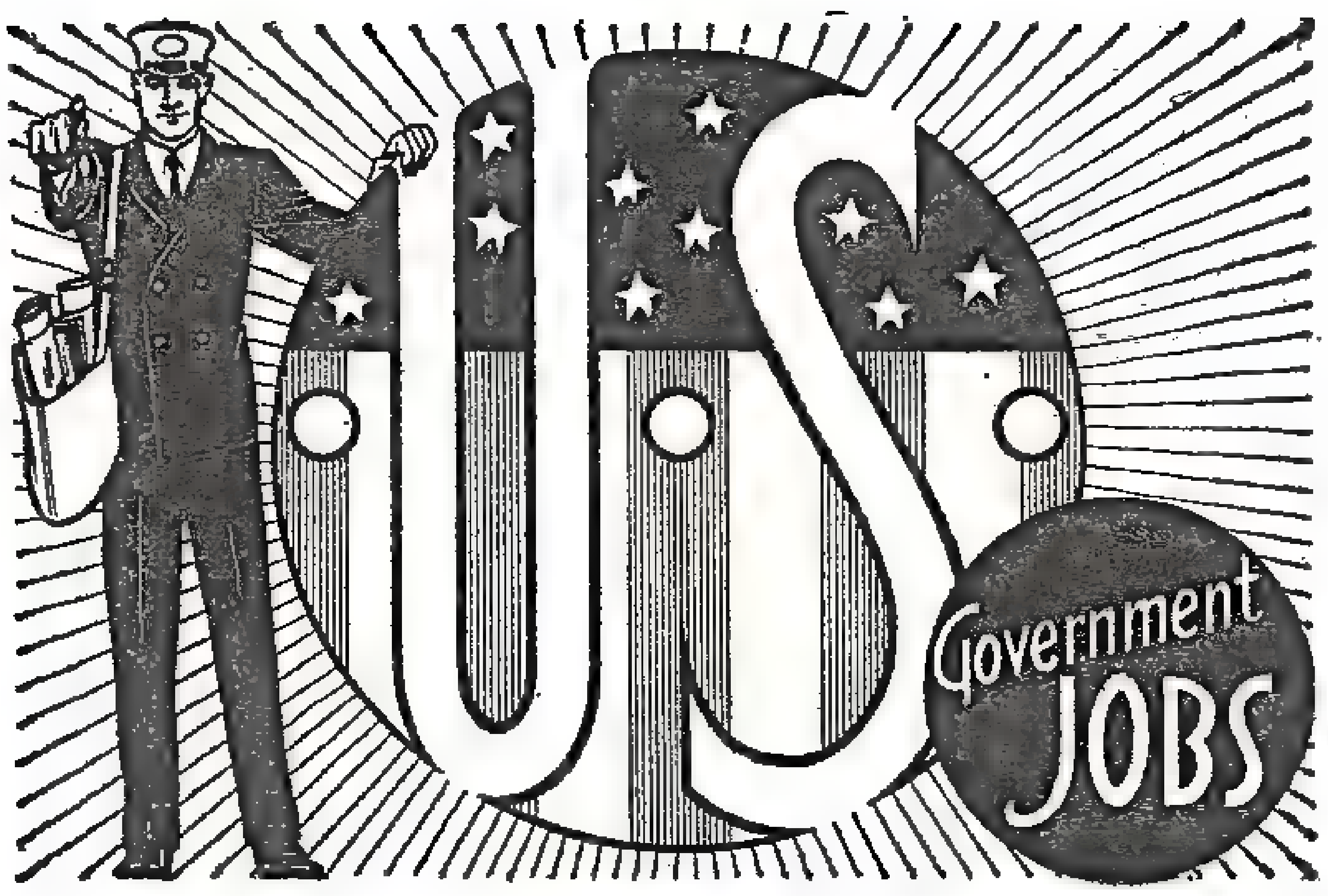
A book telling how to build radio receivers and transmitters, and including scores of set building tips and trouble-hunting kinks.

PARTIAL LIST OF PLANS

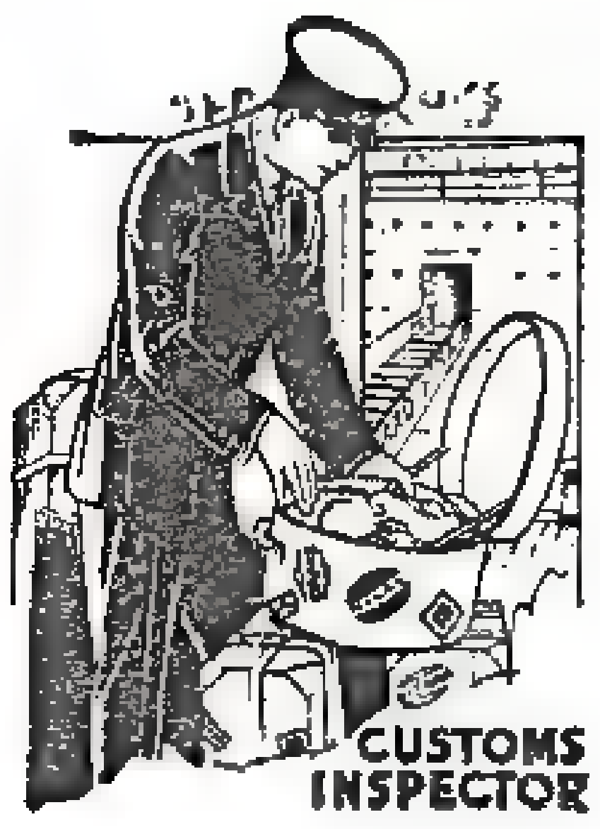
Police Call Adapter; Smallest All Electric Radio; 6-Tube Auto Radio; B Eliminator for Auto Radio; Hitch-Hiker's Portable Radio; Cigar Box Receiver; 5-Meter Transceiver; Crystal Sets; 3-Tube Toolbox Portable Set; 1-Tube Short Wave Marvel: Antenna Plans; 2-Tube All-Wave Radio; Condenser Microphone; Lapel Microphone; Smallest Broadcasting Station; Special Code Transmitter.

50c

ON SALE at Your Newsstand or Send 50 cents for your copy to
MODERN MECHANIX PUBLISHING CO.
Greenwich, Conn.



START
$1260 to $2100 YEAR
Men--Women
Common Education Usually Sufficient
Influence Not Needed

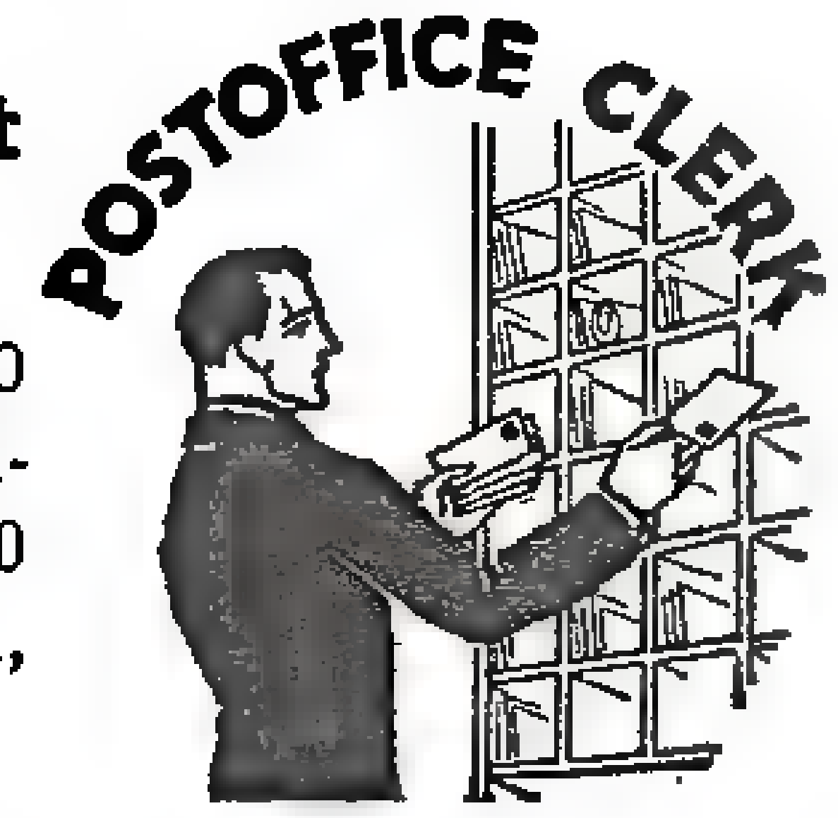


Customs Inspector

Salary $2,100 to start. Men 23 to 45. Work connected with examining baggage and merchandise entering the country from foreign parts covering boats, trains, roads, automobiles, etc.

City Mail Carriers, City Post Office Clerks

Clerks and carriers now get $1,700 the first year regular and automatically increase $100 a year to $2,100 and $2,300. Open to men—women, 18 to 45.



Railway Postal Clerks

Railway Postal Clerks get $1,900 the first year regular, being paid on the first and fifteenth of each month. ($79.17 each pay day.) Their pay is automatically increased yearly to $2,450. Advance may be had to Chief Clerk at $2,700 a year. ($112.50 each pay day.) Open to men, 18 to 35.

File Clerk—Clerk

Open to Men—Women 18 to 50. Entrance salary $1,260—$1,440 Year. Appointments as File Clerks and Clerks in the Departments at Washington, D. C., are made from this examination.

Get Ready At Once

Many other positions. Experience is usually unnecessary and political influence is not permitted. Let us show you how to get a government job.

Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment may result in your getting a big-paid government job.

FRANKLIN INSTITUTE, Dept. S261, Rochester, N. Y.

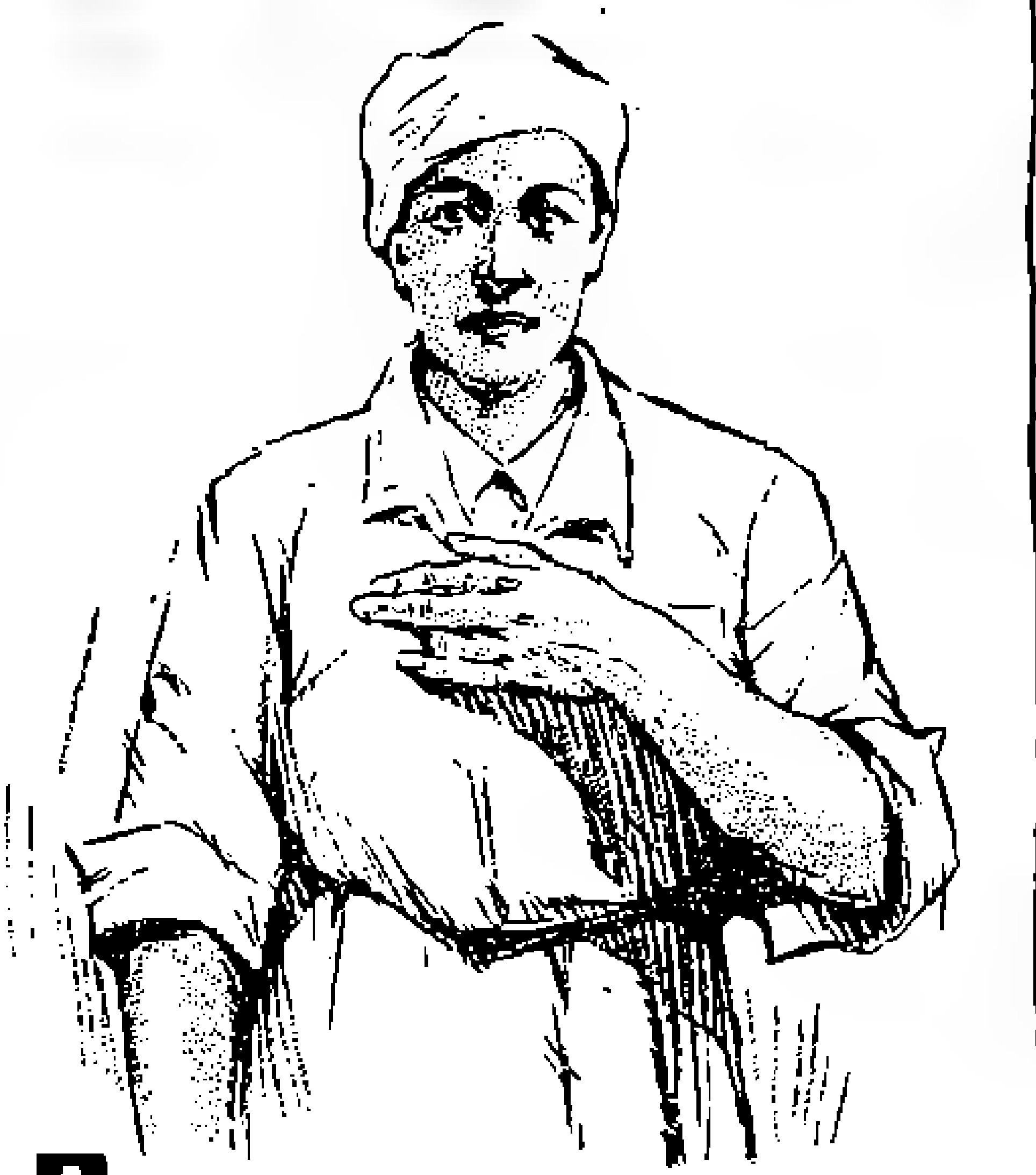
Gentlemen: Rush to me, FREE of charge, list of U. S. Government big pay jobs. Send me FREE 32-page book describing salaries, vacations, hours, work, and full particulars telling how to get one of these jobs.

Name ....

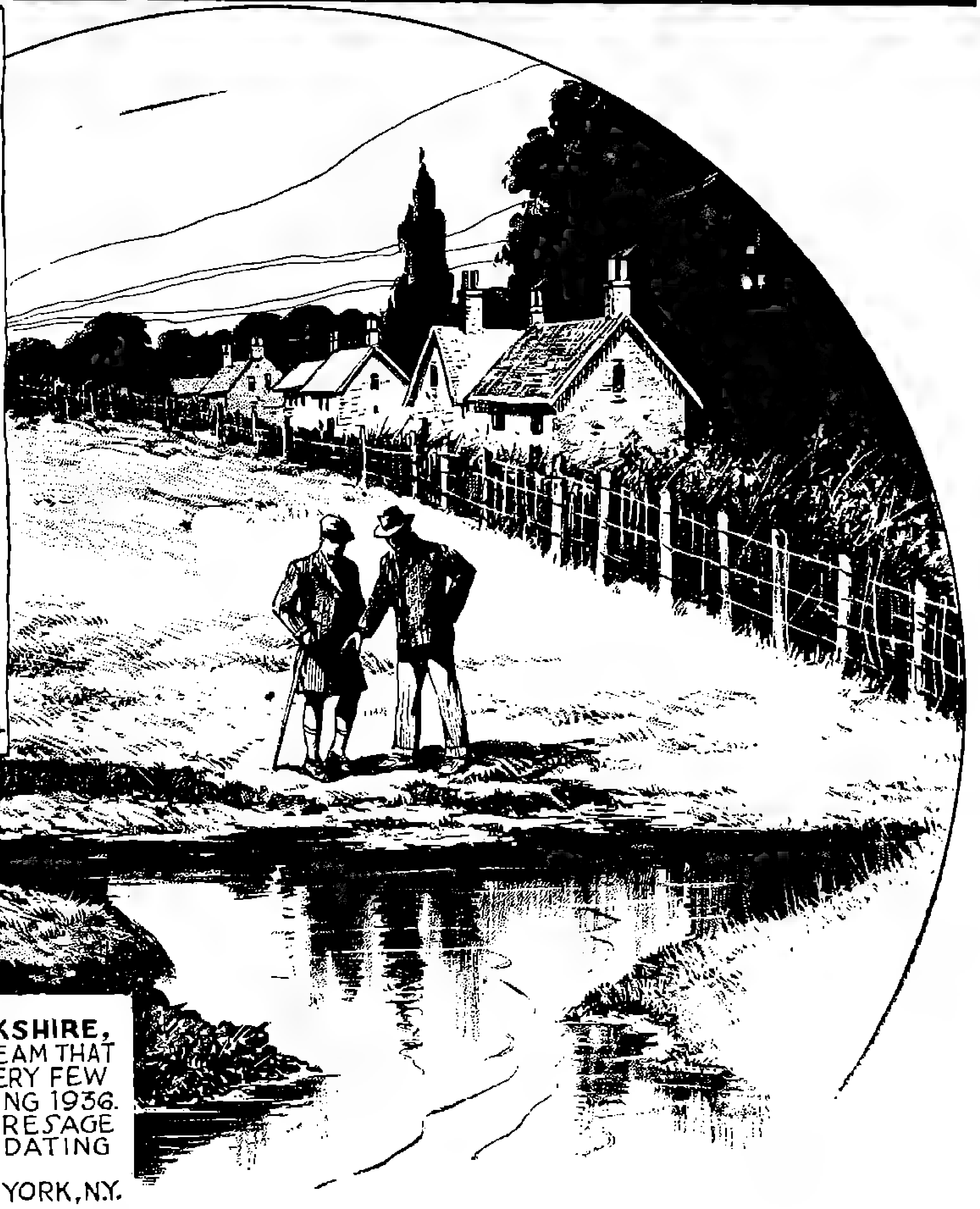
Address ....

WOE WATERS FORECAST DISASTER

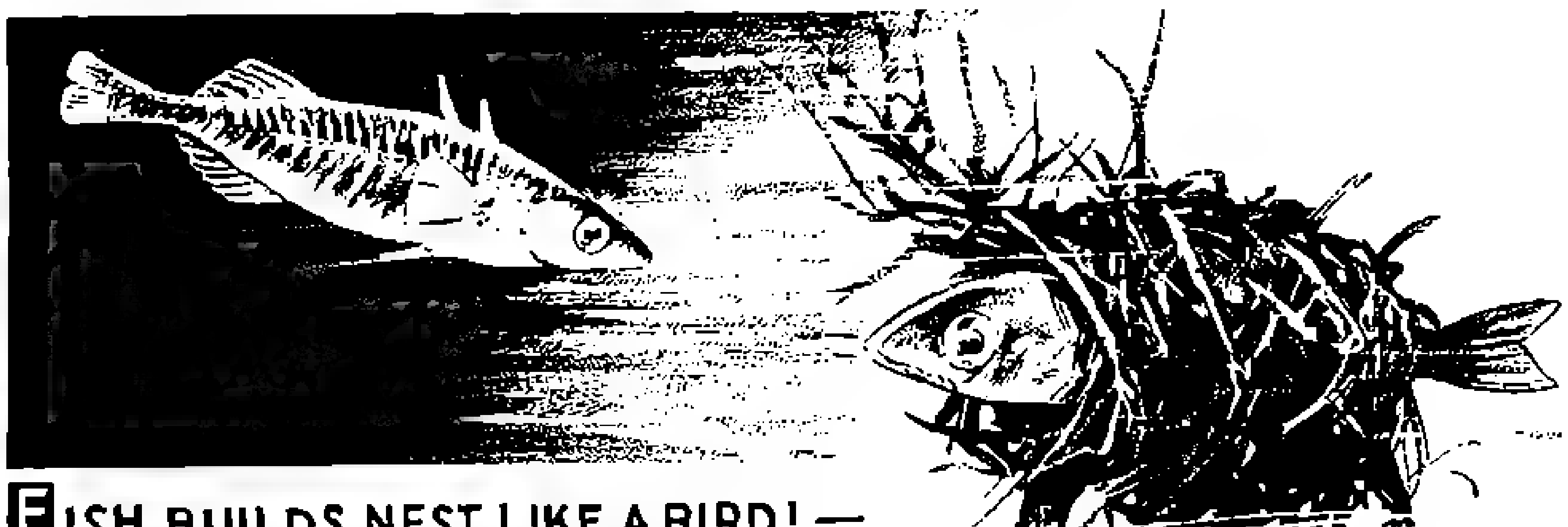
Nic Sprank Offers $5 For Best Oddity



AMPUTATE FINGER TIPS TO PLACATE THE GODS! THE TIP OF THE RING FINGER OF THE BABIES OF THE XKOSA TRIBE IN AFRICA ARE AMPUTATED TO PROPITIATE THE GODS SO THAT THEY WILL PERMIT THE MOTHER TO BEAR MORE CHILDREN.
E. GORDON LEE, CAPETOWN, AFRICA

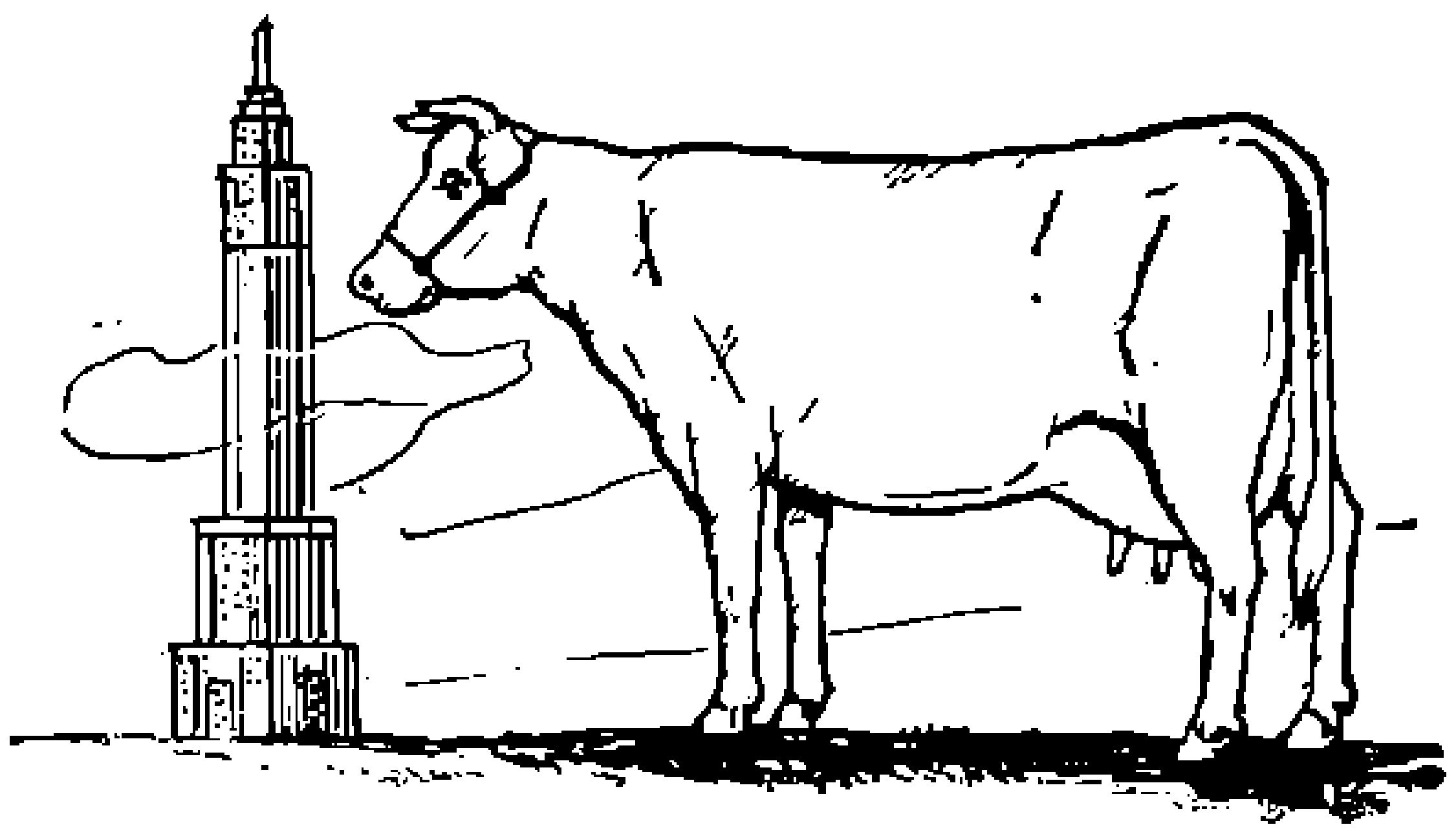


THE WOE WATERS OF YORKSHIRE, ENGLAND!—A MYSTERIOUS STREAM THAT APPEARS FOR A SHORT TIME EVERY FEW YEARS. IT APPEARED AGAIN DURING 1936. ITS APPEARANCE IS SAID TO PRESAGE WAR AND FAMINE, A LEGEND DATING BACK TO THE 12TH. CENTURY.
JOHN O'BRIEN, NEW YORK, N.Y.



FISH BUILDS NEST LIKE A BIRD!—THE STICKLEBACK FISH CONSTRUCTS A HOME FOR ITS MATE MADE OF SEA-WEED, TWIGS AND AQUATIC PLANTS WOVEN TOGETHER UNTIL IT FORMS A NEST.
RAYMOND BYRNE, LAKEVILLE, MINN.

Nic Sprank



2,700 COWS IN NEW YORK CITY!—DESPITE THE HIGH COST OF REAL ESTATE AND THE SCANT SPACE, THIS MANY COWS ARE STILL MAINTAINED WITHIN THE LIMITS OF THE METROPOLIS PRODUCING MILK FOR LOCAL CONSUMPTION. THEY ONLY BEGIN TO SUPPLY THE 3,000,000 QUARTS SOLD DAILY IN THE CITY.—GEORGE VAN DYKE, NEWARK, N.J.

Five dollars will be paid for the Oddity used by Nic Sprank as his central illustration. One dollar will be paid for all others used on this page. Send your Oddity to Nic Sprank, Modern Mechanix Publishing Company, Fawcett Bldg., Greenwich, Conn. Source or proof of each Oddity must be given. Send all Oddities separately, not with other manuscripts or letters.

CHEMISTS for INDUSTRY

A Guest Editorial

Emile F. du Pont

THE question of "what does industry expect of its chemists," is one about which much has been written. There are certain factors that we must take for granted. We will assume that all courses are essentially the same. Such qualifications as good character, good health, neat appearance, courage, dependability, and industry we expect in all prospective employes.

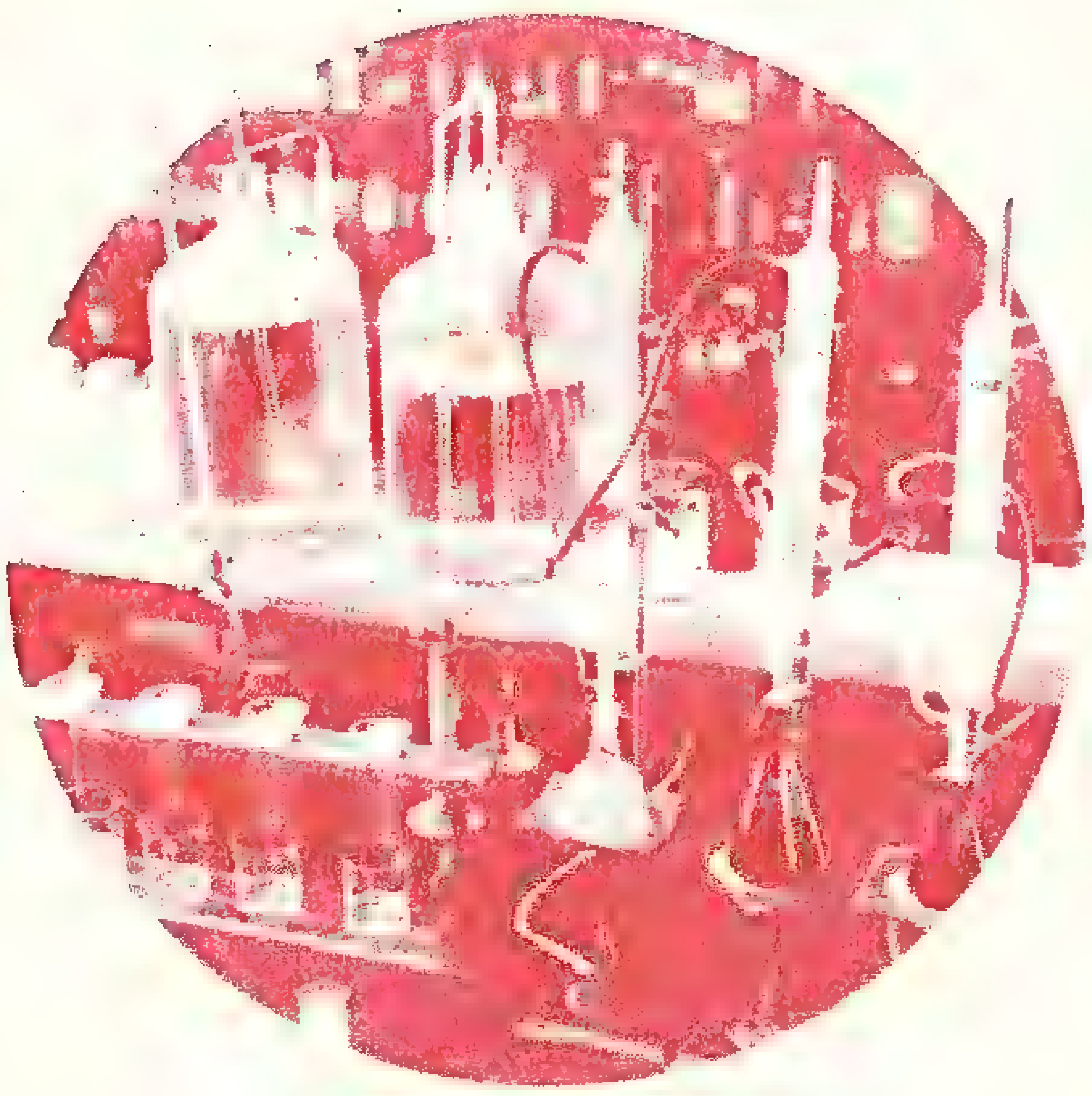
Presupposing a good technical background, one of the most important things is good personality. To me this does not mean merely a man with a pleasant smile. It is really the characteristic that enables him to get things done. In modern business it is not the lone wolf who achieves results but rather the combination of the efforts of the group.

A characteristic which we regard as extremely important is loyalty. Considerable public good-will can be obtained by the contacts the public has with a concern's employes, and conversely, a great deal of ill-will can accrue if the employes are not loyal to their employer.

Accuracy is another essential point which we require in our chemically trained men. It is important that when a man makes a statement that he states the facts as they are. The most successful man, of course, is the one who is entirely open-minded and willing to learn as much as possible from others as he progresses up the ladder. A technical education can be regarded as a tool in a man's equipment which will help him achieve his ambitions.

It is generally necessary for industry to train young men to think in terms of money outgo and income. The young chemist who goes into manufacturing work at the start quickly picks up this quality because of his daily association with profit and loss in operations.

To sum up, still presupposing that he has been subjected to a good technical course, we expect these things of a young chemist. He must have the proper personal qualifications to fit into and develop in an organization. He must have a mental excellence as indicated by class standing and should have broadened himself by extra curricular activities. He should be loyal. He should have ability to speak and write clearly and concisely. He should be accurate. He should have some knowledge of the cost of doing business. He should have an understanding of modern industrial organization.



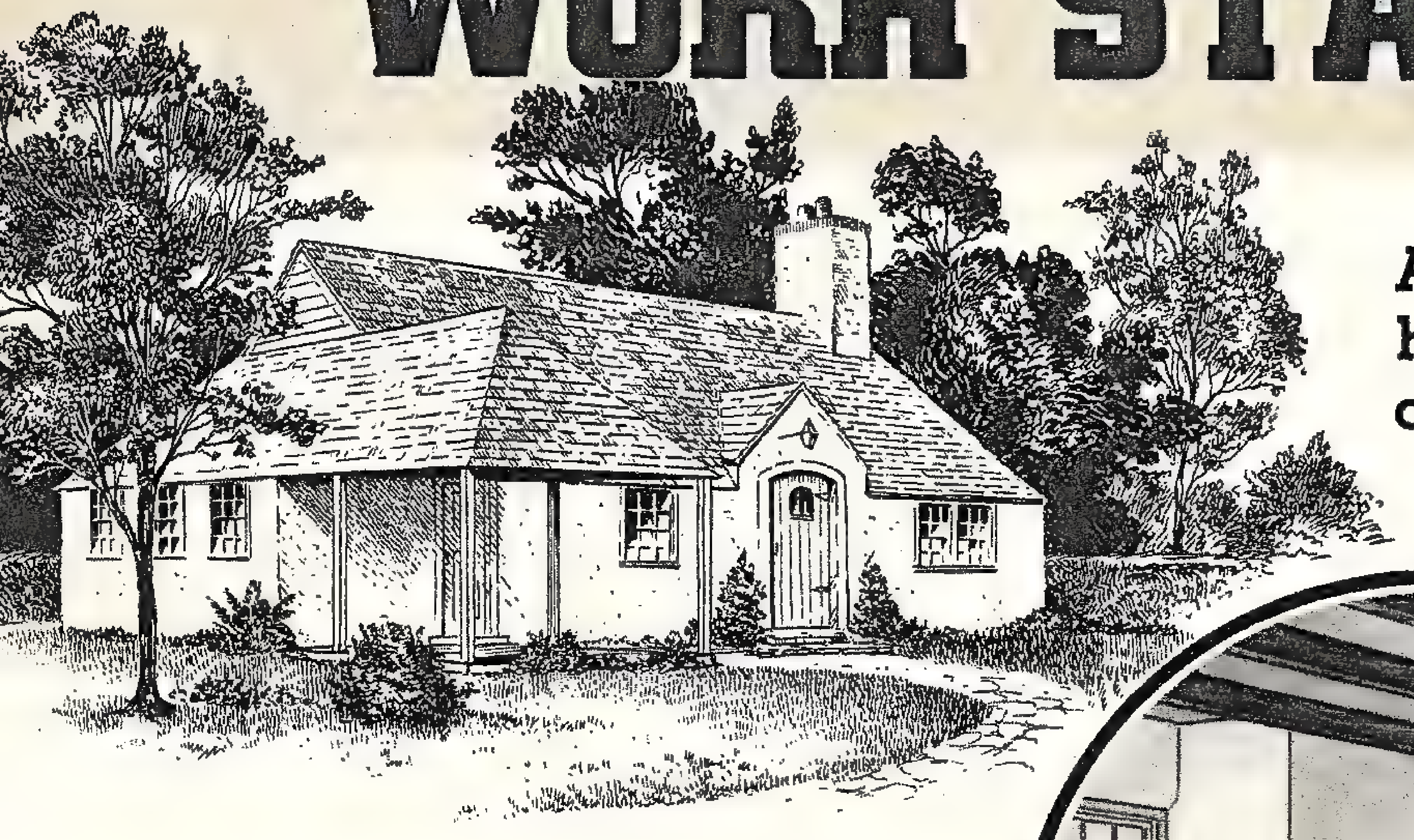
Emile F. du Pont

PERSONNEL MANAGER

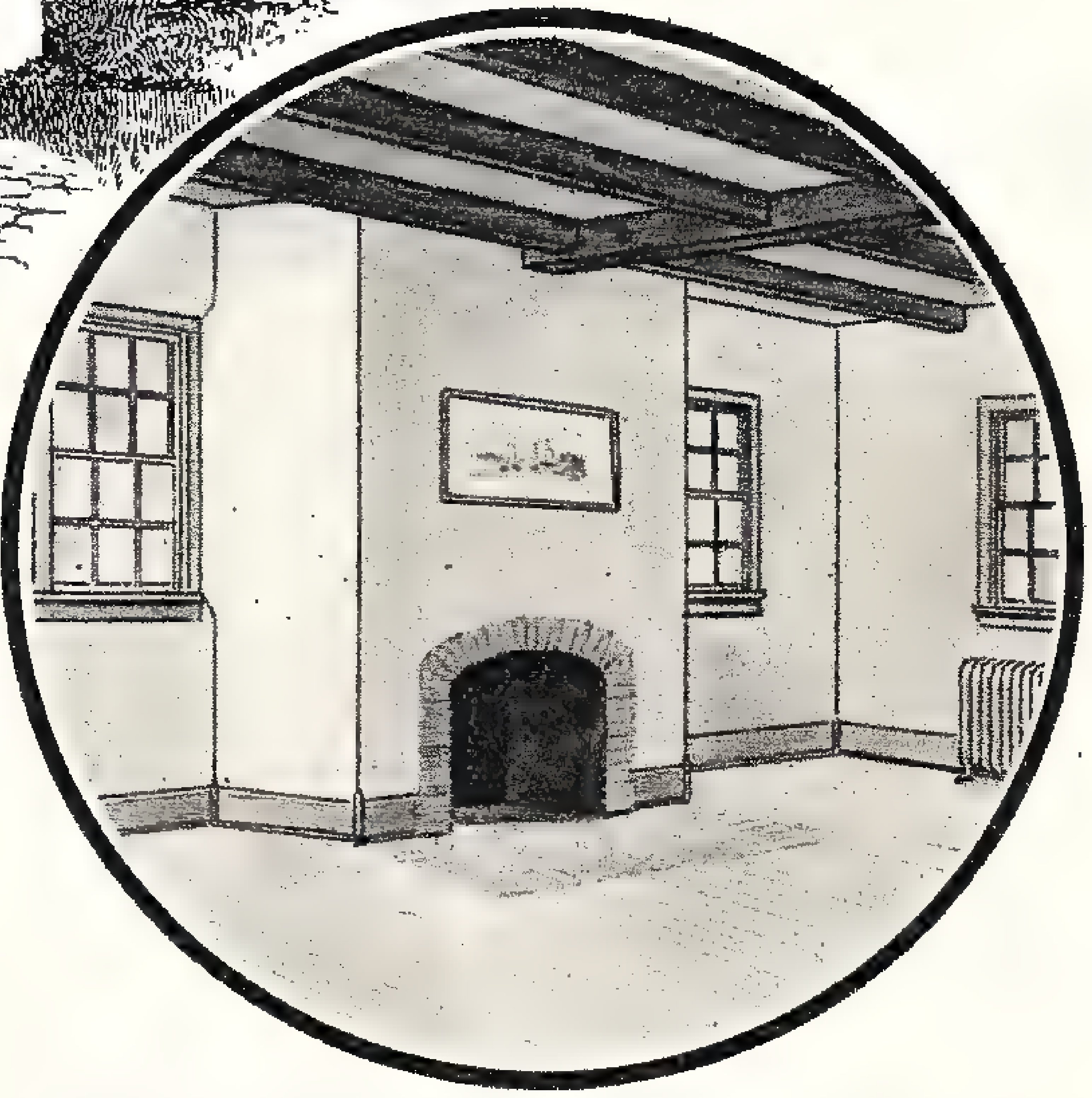
E. I. du Pont de Nemours & Co.

WORK STARTS

Architect helps builder obtain best for money.



This attractive $3,500 model residence is being constructed by Modern Mechanix in Leonia, N. J., five minutes' drive from the George Washington Bridge over Hudson River. It will demonstrate the ease with which the average man can finance and build his home.



Specifications for the home call for a brick wood-burning fireplace in addition to a steam heating system designed to maintain an even temperature of seventy degrees even in sub-zero weather.

CONVINCED of the ease of building their own homes, Tom and Jim and their wives purchased their building lots. Now spread before them were the blueprints—the plans of dreams which a short while before seemed impossible. Yet they were fast coming true.

Jim had a small grocery store, $3,000 in savings and two children for whom he was doing his best in a crowded city flat. Tom, on the other hand, was a clerk earning $1,200 a year. After many years of strict economy he and Mary had managed to save $1,600. Jim liked to find his recreation puttering about in a home workshop; Tom was an amateur photographer, with a passion for doing his own dark-room work. Their city flats did not afford room for their hobbies.

They were discussing these one day when Bill Johnson, who worked in an architect's office, showed them how his Boss could help them build their own homes which could be paid for at a cost cheaper than rent.

Tom's home—a one-story, four-room house to be built at a cost of $3,500 in Leonia, N. J., a few minutes from the George Washington Bridge that connects New York and New Jersey—has been selected as a model home by this magazine, and construction is under way.

Tom learned that with $1,230 in cash—including $600 for his lot—he could secure a loan of the additional $2,870 necessary from an independent building and loan association or one connected with the Federal Home Loan Bank or the Federal Housing Administration. The loan, payable at $29 a month, must be paid back in ten years.

Jim, because of his two children, required a bigger house. His two-story, five-room home will cost $5,500. Of this amount he has $1,890 cash, and must seek a loan of $4,410, which he must pay back at the rate of $45 a month for the next ten years.

Since the day they decided they could afford to build their homes things had been moving rapidly. Everything was ready now to submit to the contractors.

The blueprints of plans and elevations of both houses, with specifications fully explaining just what must be built into the homes and how to do it, included all the suggestions that Tom, Jim and their wives had made.

on MM HOME

by Wesley Sherwood Bessell

New York Architect

All the ideas that they desired in a home were carefully worked out. The plans were drawn up to a scale of one-quarter inch to the foot, and were similar to the original smaller sketches but with such changes as they had carefully discussed. It was agreed that requests for estimates be made at once.

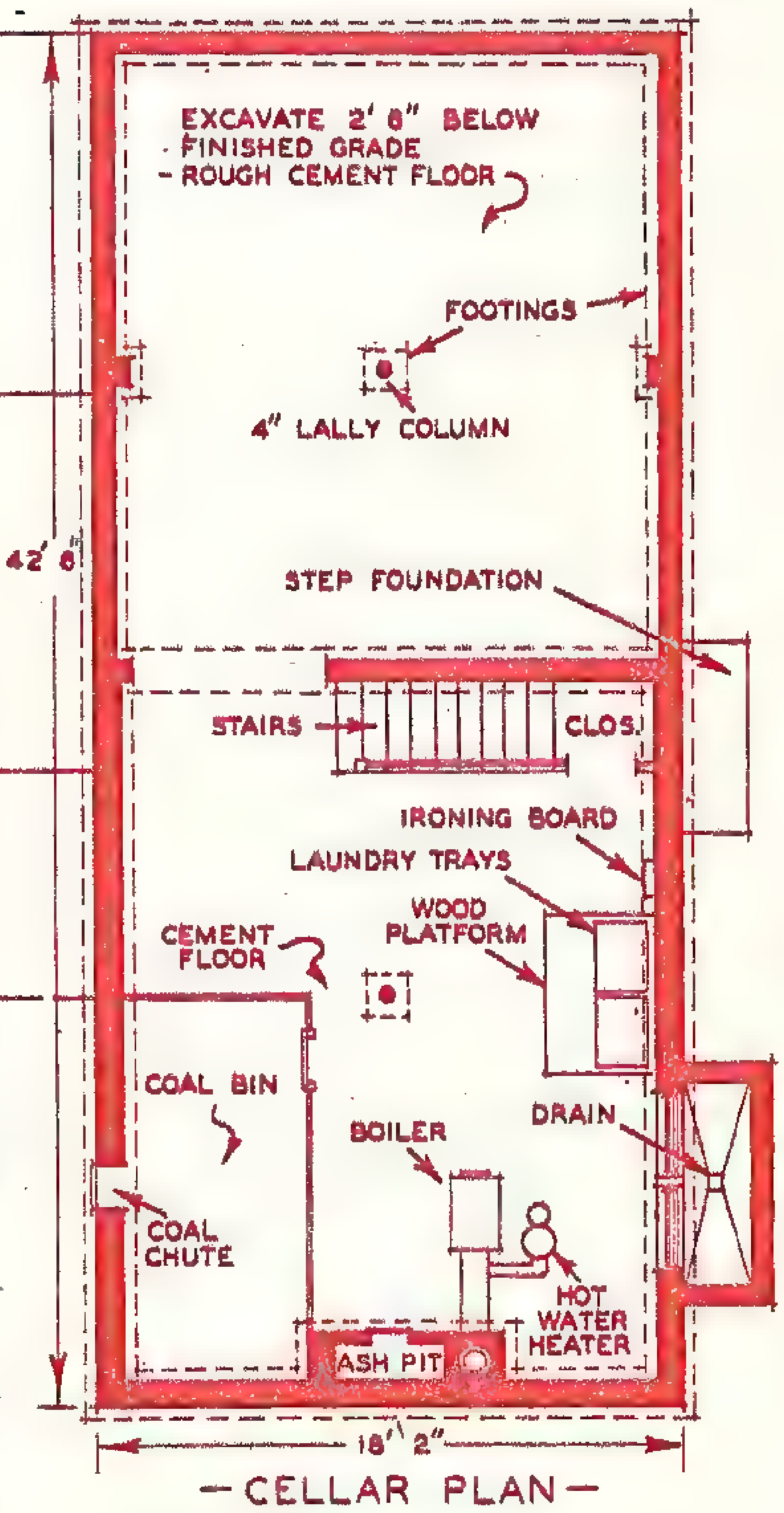
"But what if the figures run more than our allowances?" asked Tom.

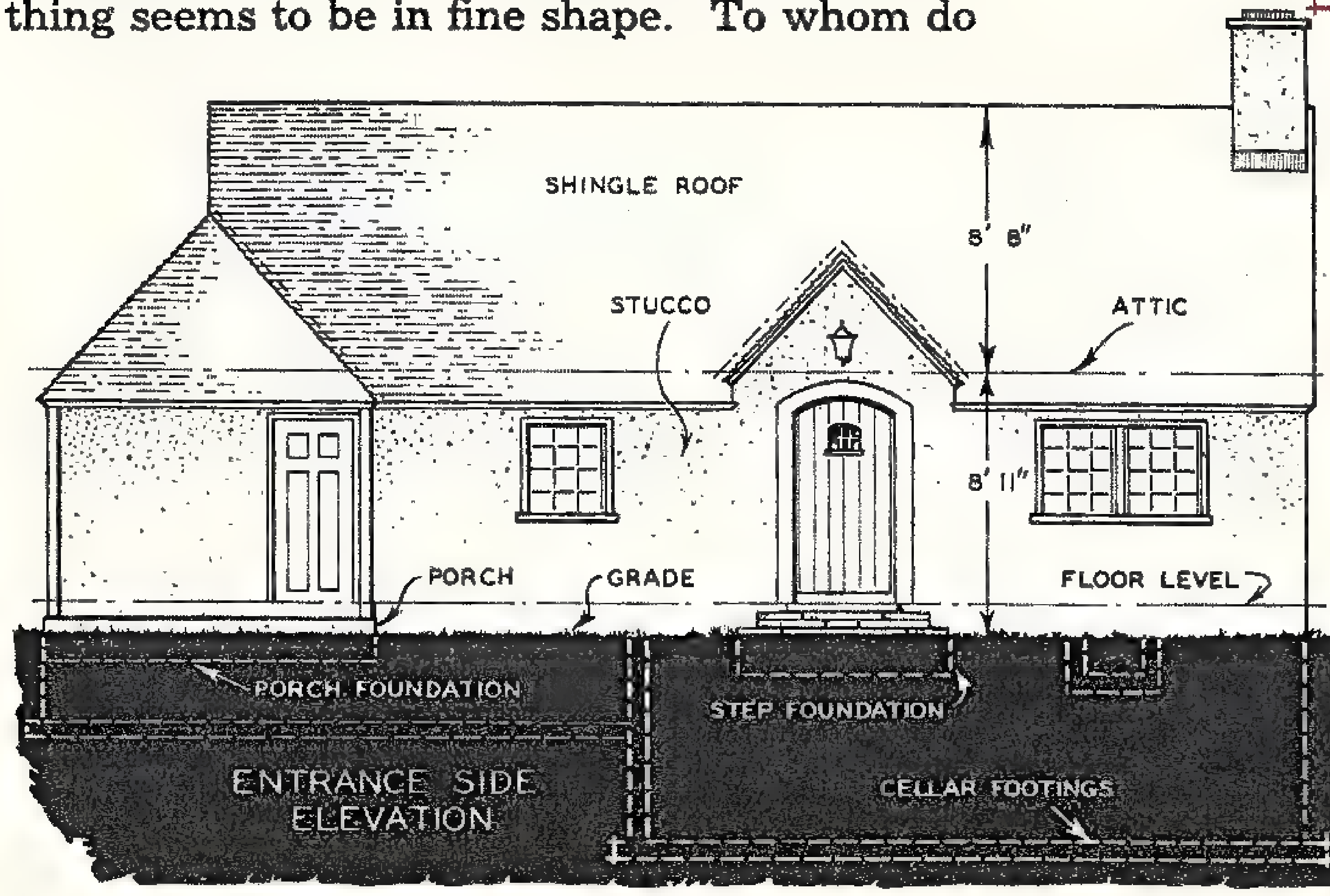
"In that case," Bill answered, "we usually call in the two lowest bidders and suggest that certain modifications be made in the plans and specifications whereby the cost can be brought within the allowed amount. Or, if necessary, we make up an entirely new set of plans and specifications cutting the room sizes and thereby reducing the cubage, together with other changes, and send these plans out for new estimates."

He went on to explain that the architect usually assumes the responsibility for the second set of plans, and that there is no charge for the additional work. He added that an architect endeavors to obtain as much for his client as he can, including the best and latest improvements. If all these come within the allowance, so much the better, but if figures are higher, he pointed out, he knows of savings he can suggest to the builder.

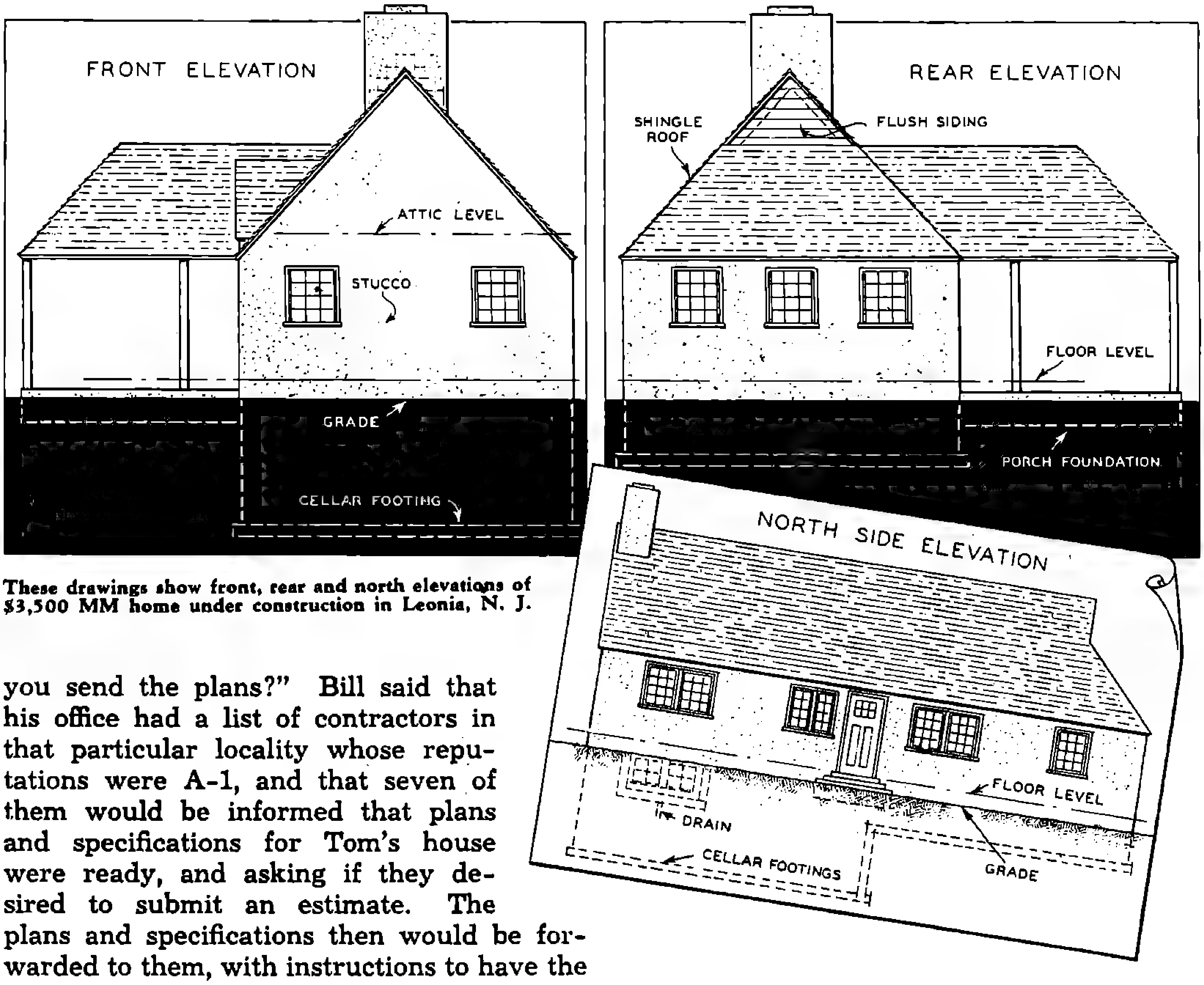
"Well," said Tom, enthusiastically, "everything seems to be in fine shape. To whom do

Wesley Sherwood Bessell, the author, is well known for the homes, schools and postoffices designed by him in recent years in Long Island and New Jersey.


PORCH FOUNDATION
EXCAVATE 2' 8" BELOW FINISHED GRADE
ROUGH CEMENT FLOOR
FOOTINGS
4" LALLY COLUMN
42' 6"
STEP FOUNDATION
STEP FOUNDATION
STAIRS
CLOS.
IRONING BOARD
LAUNDRY TRAYS
WOOD PLATFORM
CEMENT FLOOR
COAL BIN
DRAIN
BOILER
COAL CHUTE
HOT WATER HEATER
ASH PIT
18' 2"
— CELLAR PLAN —


SHINGLE ROOF
8' 8"
STUCCO
ATTIC
8' 11"
PORCH
GRADE
FLOOR LEVEL
PORCH FOUNDATION
STEP FOUNDATION
ENTRANCE SIDE ELEVATION
CELLAR FOOTINGS

These drawings show basement and foundation plans for the home. Concrete blocks will be used for the foundation walls. Basement walls will be made watertight by cement mortar inside and outside.



These drawings show front, rear and north elevations of $3,500 MM home under construction in Leonia, N. J.

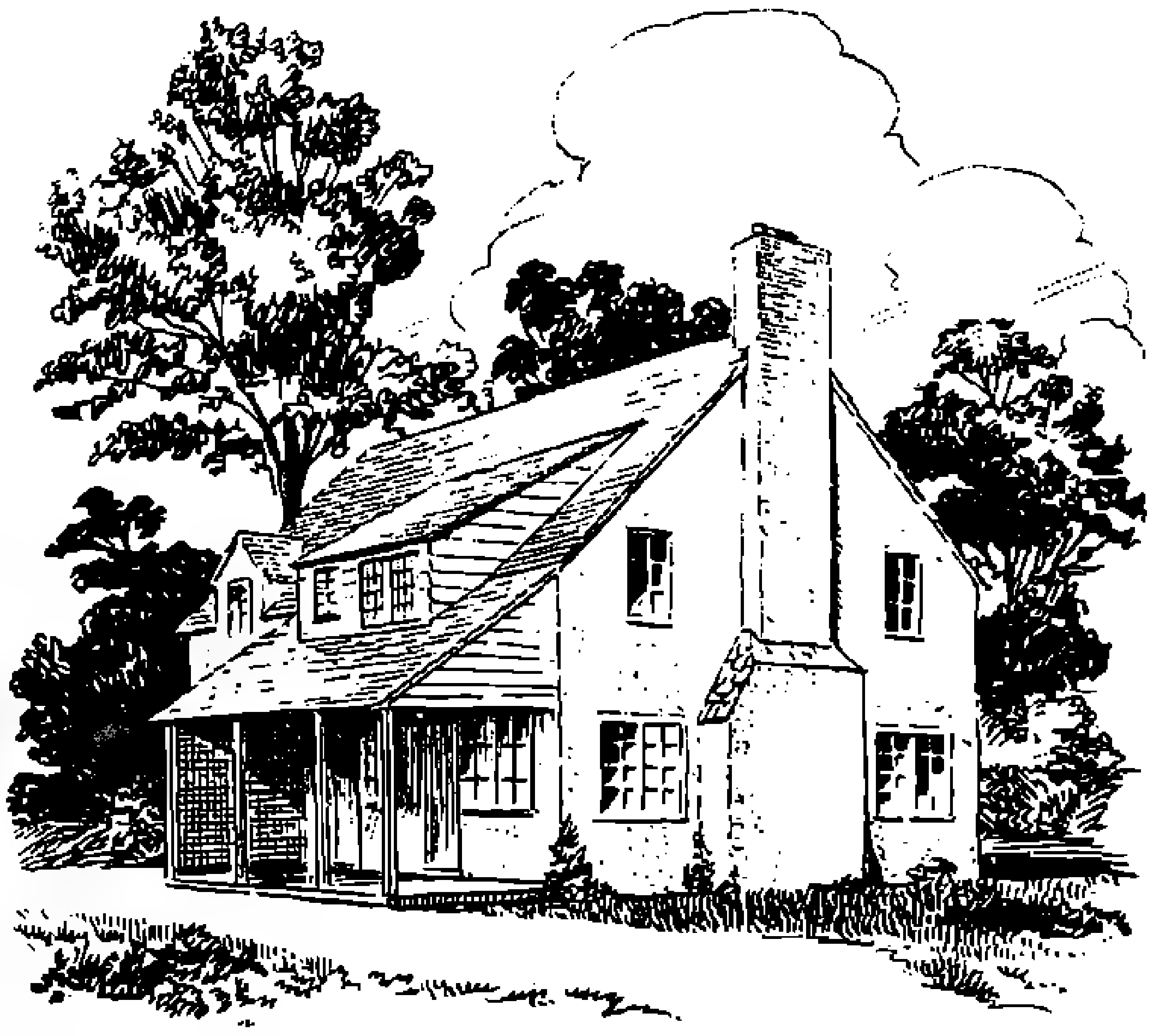
you send the plans?" Bill said that his office had a list of contractors in that particular locality whose reputations were A-1, and that seven of them would be informed that plans and specifications for Tom's house were ready, and asking if they desired to submit an estimate. The plans and specifications then would be forwarded to them, with instructions to have the bids back in the architect's office on a specific date. In Tom's case he said a two-weeks limit would be sufficient on bids.

The contractor, Bill went on, estimates on everything, including plumbing, heating and electrical work. By having one man responsible for the erection and completion of the entire house, Bill explained, the architect is unaware of the wrangling between subcontractors, if one should be inclined to blame the other for delays and holding up of the work. The general contractor, he pointed out, thus co-ordinates the various trades and sees to it that everything is kept moving. Bill then detailed what he meant by supervision of the work by his office, explaining that he will visit the job once a week and inspect all the work and material.

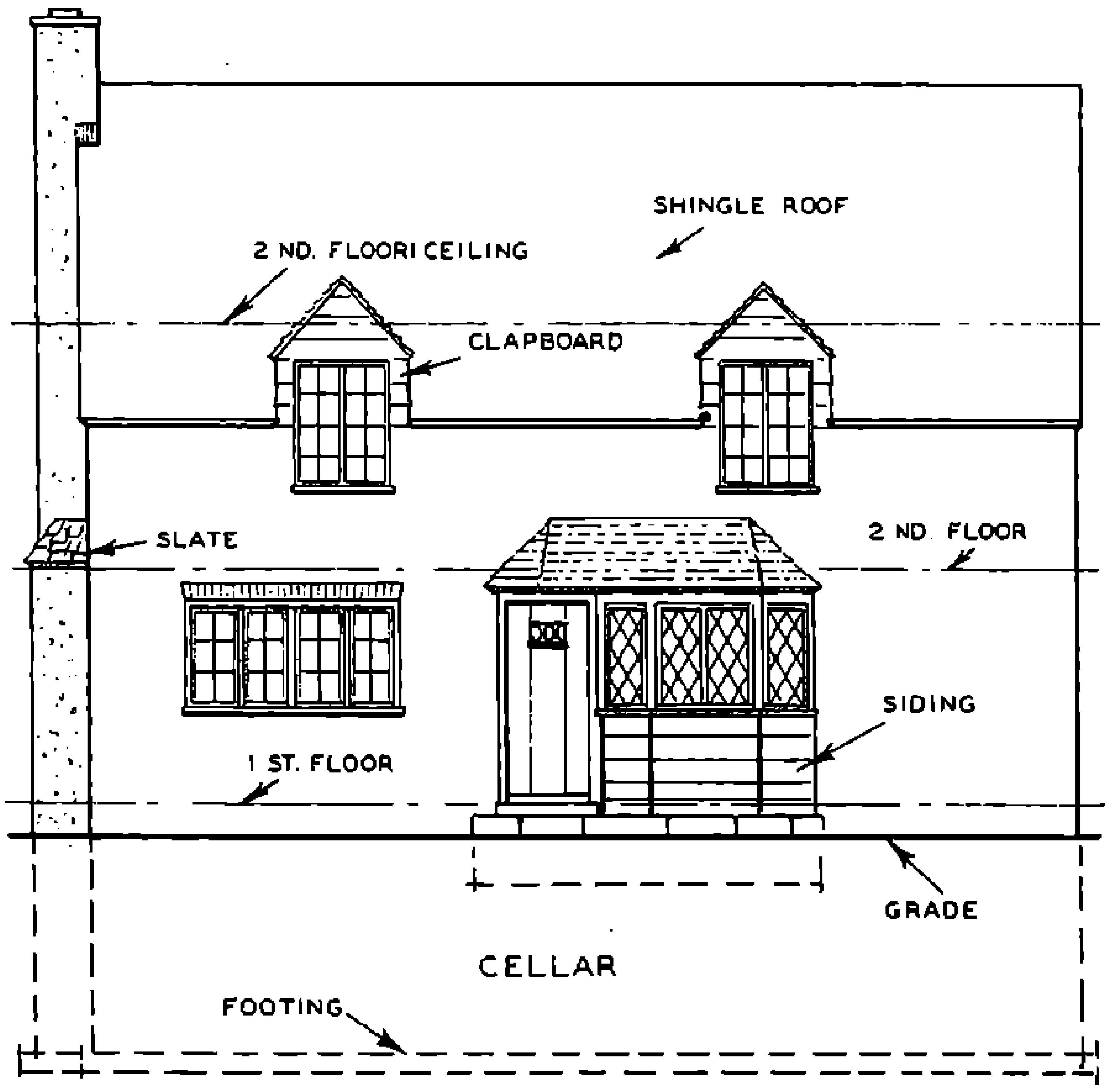
"I will know whether or not we strike water when we excavate; when the footings are placed, I will see that the concrete is of the correct mix and placed at the proper level. I must make sure that the proper materials are used in the foundation walls, and that the work is well constructed. After that the floor beams and wall plate are put into place. The plate must be secured to the foundation walls by anchor bolts, and the floor beams must be of the specific sizes and grades. These must be properly spaced and cross-bridged. The exterior framing, such as studding, rafter plates, attic beams and rafters must all be checked.

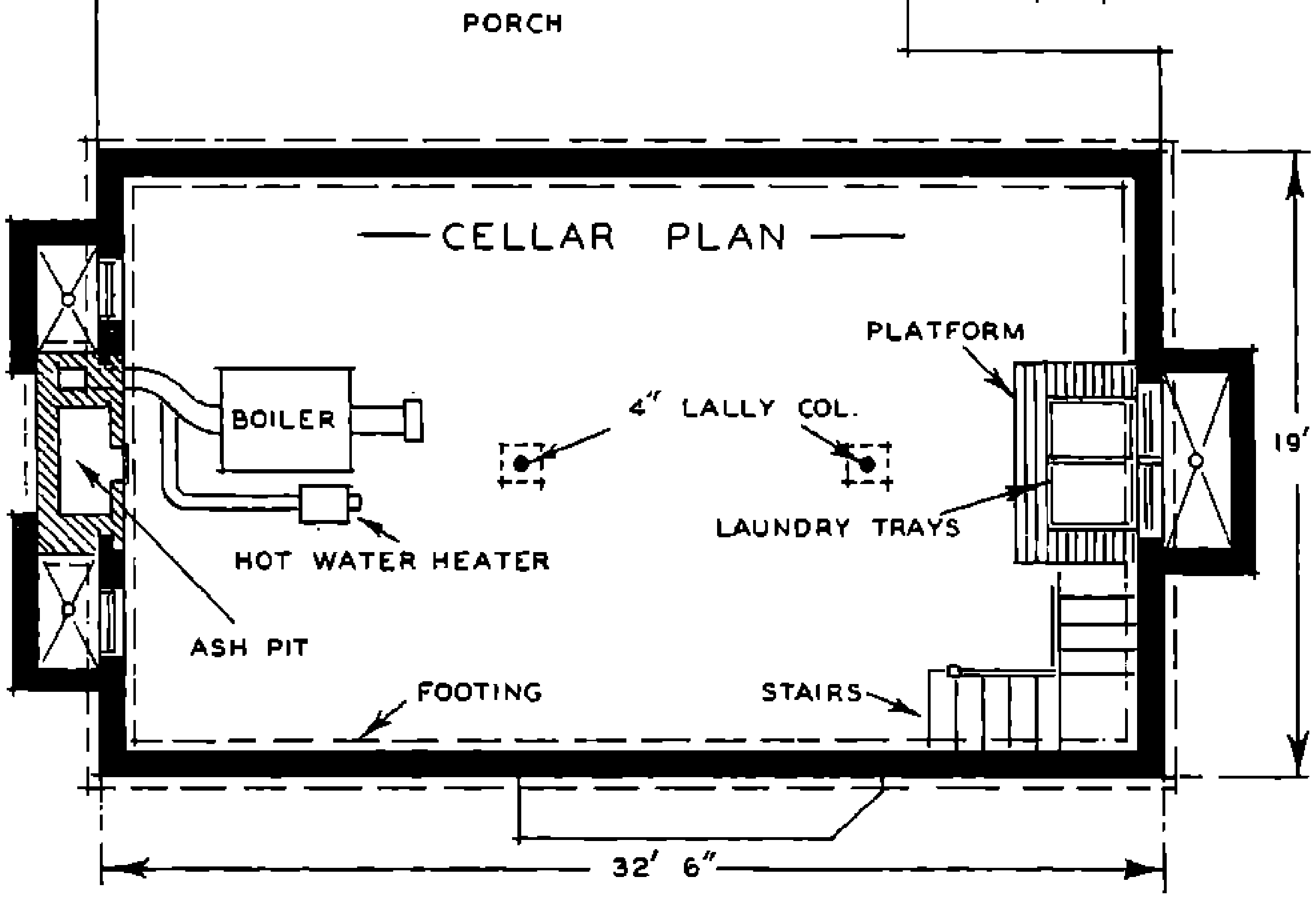
"Then comes the sheathing and roof lathing for shingles. Wood shingles will last some 20 to 25 years. I have seen some shingles 100 years old. While this work progresses the plumber, the steamfitter and the electrician will start their rough work, putting in piping and wiring. This must also be inspected, and in the case of the plumber, when his work is all roughed in, he puts on a test for my inspection.

"These same mechanical contractors also must be watched when cutting beams in order to run their various pipe lines. You can only cut a certain amount of slots out of a beam or stud with safety. Too deep a cut becomes dangerous. Very often the plumber, or steamfitter, is interested only in getting his pipes to the desired spot for his work, and will cut too deep into structural beams or studs, weakening them."



This illustrates the type of model residence which can be built for $5,500. There are two floors giving ample room for a growing family. This is a back view.





These drawings indicate the front elevation, window arrangement, cellar plan and similar features of the more expensive house which is being described in this series of articles.

"There seems to be a great deal to know about and to watch out for," remarked Tom.

"You are correct there," said Bill. "These things are only a part of the many details that come under the scope of proper supervision. Without supervision many things can be covered up, and these defects only become apparent as time goes on."

At the end of three weeks the final estimates were received. Both Tom and Jim were eager to know the outcome.

"It is like an election—you don't know the result until all the figures are in," said Jim. "But the news is not so encouraging for you, Tom. Your figures ran considerably over your allowance."

Tom was disappointed, but realized that such things happen, and so was ready to abide by Bill's advice and be patient.

At a second meeting two weeks later, Tom was told that, by using coal for heating in place of oil; substituting stucco for the brick veneer; simplifying the waterproofing, as the contractor assured Bill that the cellar would be dry in this particular location; reducing the size of the house by one foot, and a few other minor changes, the work could be started at once.

The contract made between the contractor and the owner was the standard form of agreement issued by the American Institute of Architects, and which is recognized in all courts. It covers the time of completion, the contract amount, the time of progress payments, the final acceptance of the job and the final payment.

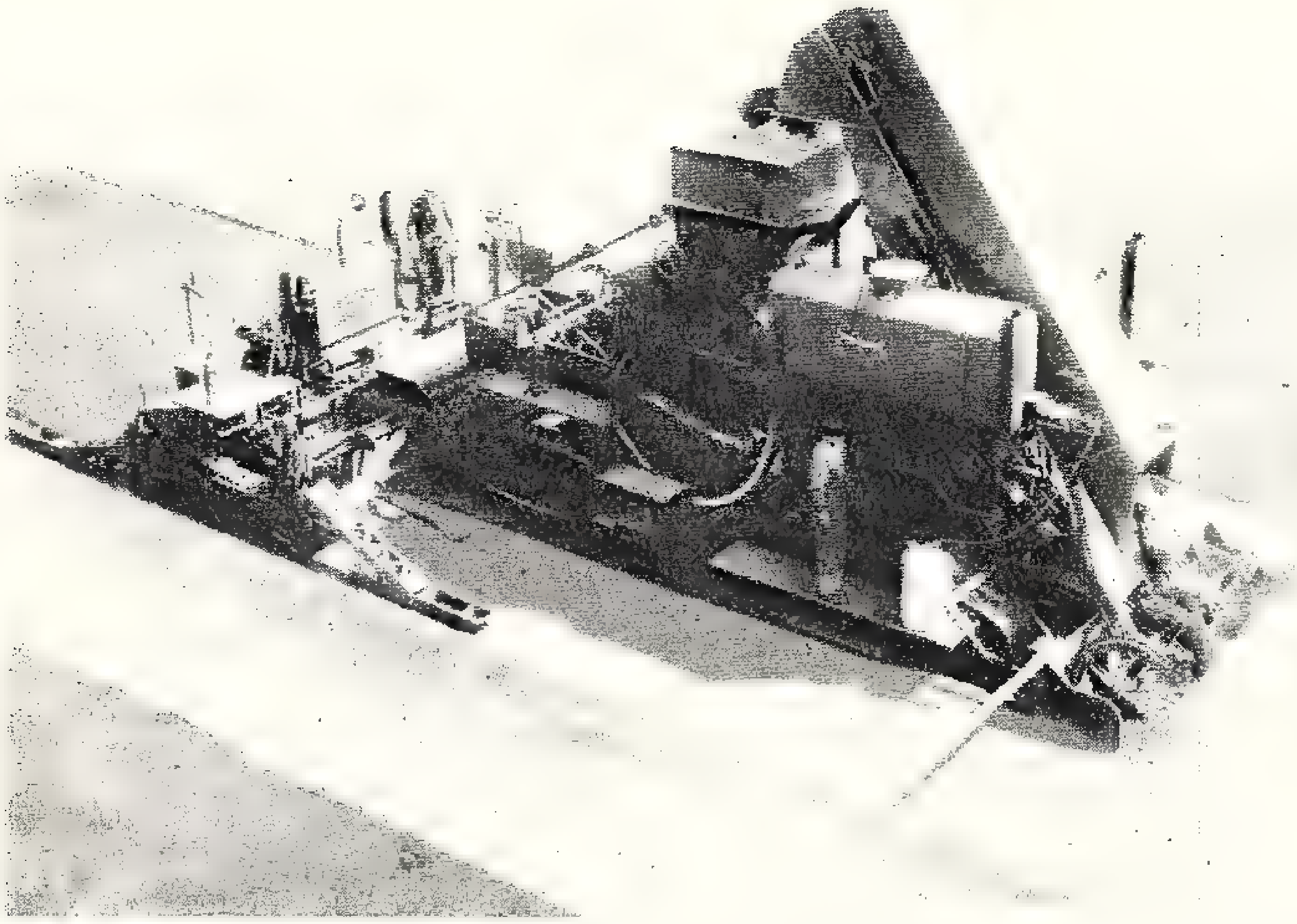
That night Tom and Mary pored over the specifications and general conditions of the contract they had signed, and were more and more elated over the splendid little home they were about to build.

"It seems almost unbelievable," remarked Tom. "Although we are putting everything we have in it, I didn't think you could get much more than a shack for what we could afford. Yet no more pains could be taken to make the house perfect if it was costing a hundred times as much."

They thought they could hardly wait until the workmen started the excavation for the

[*Continued on page* 153]

Huge Machine Builds Road In Single Operation



Taking in road building material at one end, this huge gasoline-driven engine mixes them and proceeds to lay a farm-road pavement at the rate of one mile per day.

TRAVELING at the rate of one mile per day, a big self-contained paving plant on wheels gulps up road building material at its front end, thoroughly mixes it with bitumin, and discharges it at the rear in the form of a finished 20-foot wide "farm-to-market" type pavement.

The machine is operated by powerful gasoline engines and travels on crawlers. Manufactured by the Barber-Green Co., of Rockford, Ill., it is widely used in the arid districts of the West, where it uses the desert sand, one of the principal ingredients of the road building operation. The speedy road paver is economical.

Typewriter Has 2,000 Keys

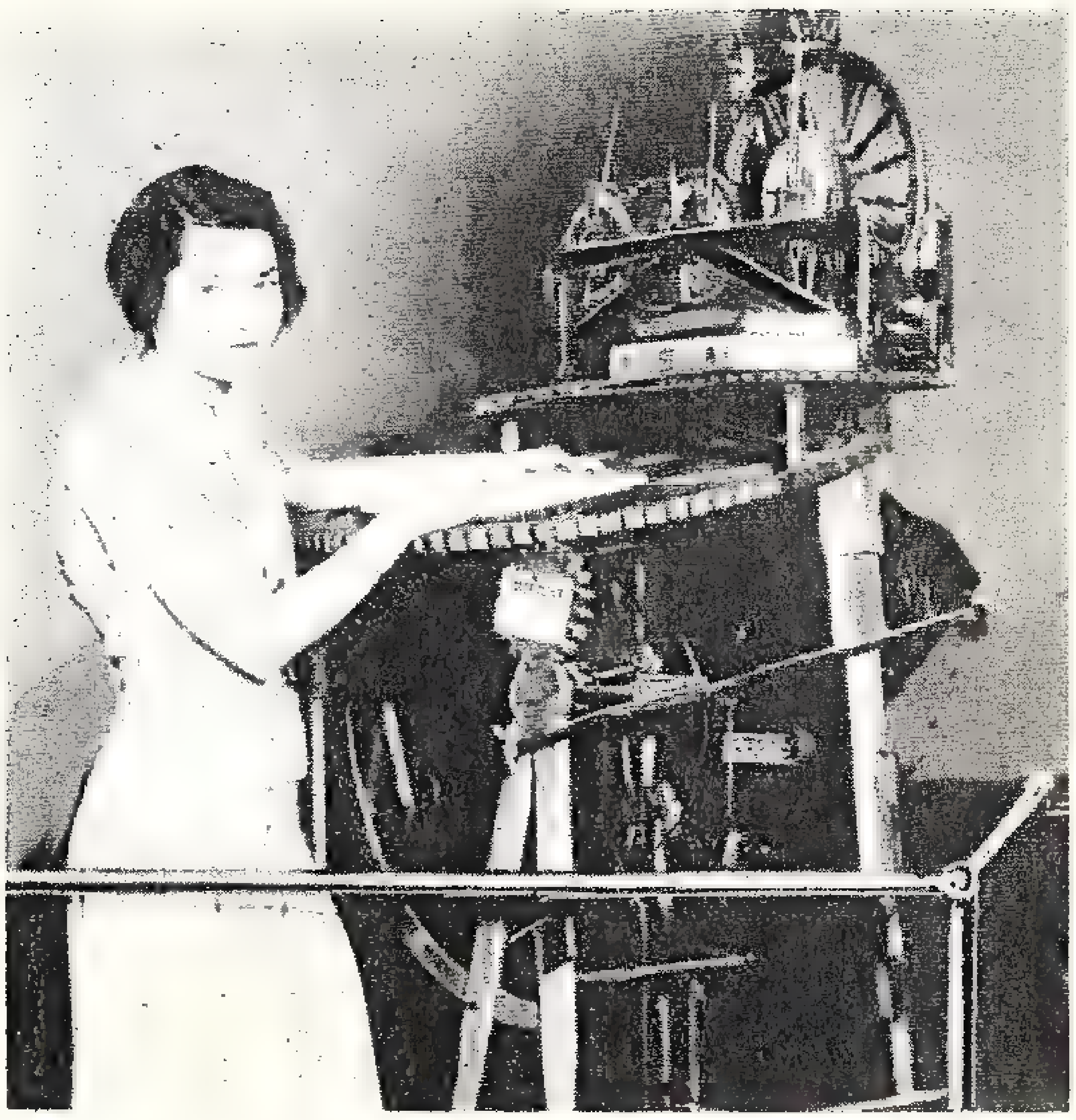
AN INGENIOUS typewriter containing 2,000 Japanese ideograms besides the usual assortment of Roman characters for European languages, has been invented by Hizen Izutsu, teacher at a vocational school in Osaka, Japan.

Despite the enormous keyboard capacity, the novel typewriter is smaller than many ordinary standard typewriters previously in use. The machine sells at about $50.

Simple in operation, there is but one type-lever. It picks up the type, one piece after the other, from a movable lettercase, and places them back immediately after the touch is performed.

Hizen Izutsu, Japanese inventor, watches a student operate his new typewriter. It has a keyboard of over 2,000 letters and types notes in both Japanese and European languages.

College Has Study Enforcer



This study enforcer scoops up a book and places it before the student. Built 75 years ago by John Muir, famed naturalist and writer, it is owned by University of Wisconsin.

AN OLD machine owned by the University of Wisconsin is called the study enforcer. The unusual device is actuated by a clock-like mechanism and its mechanical fingers scoop a book off the desk and return another one until the student has completed reading the scheduled volumes.

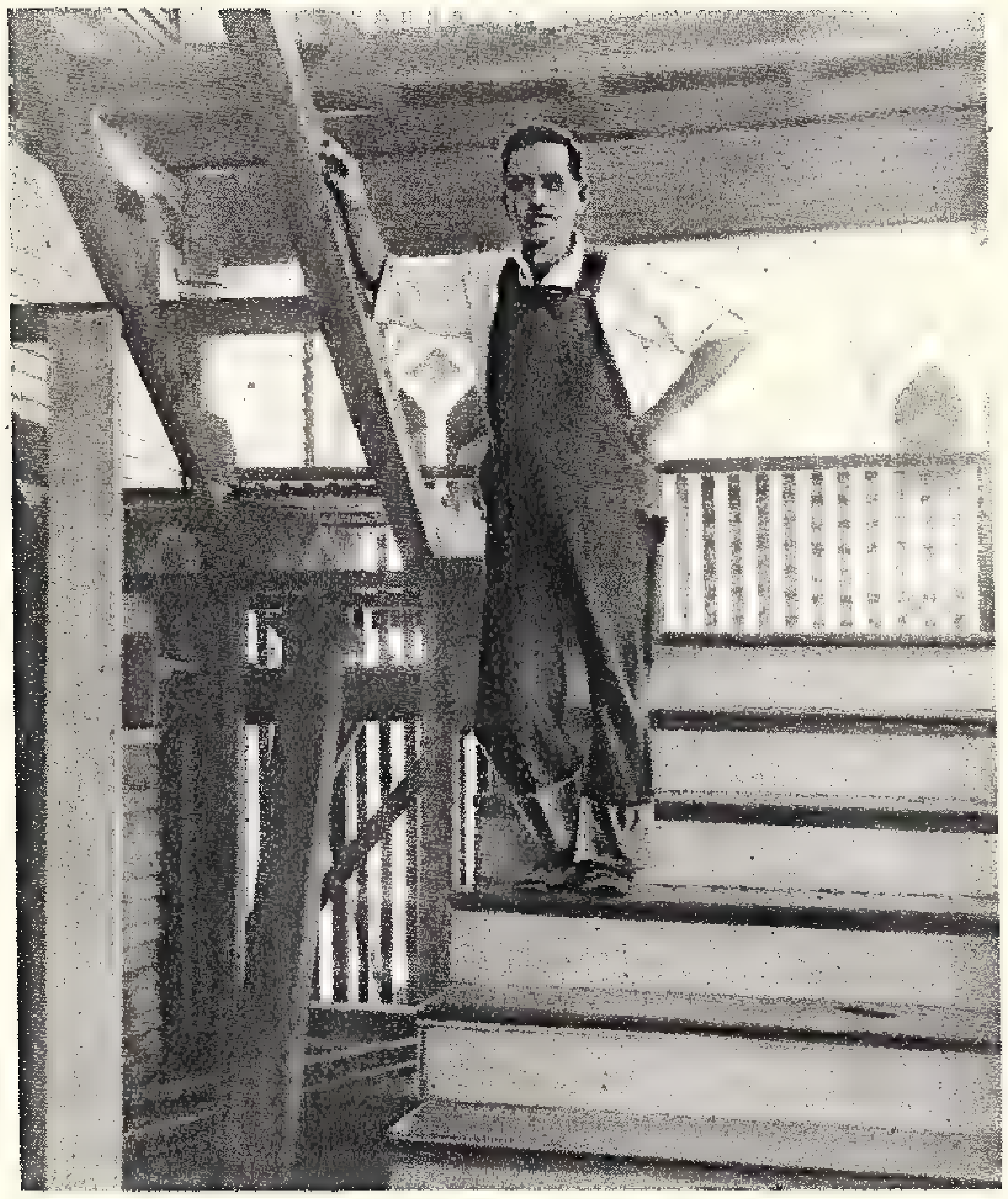
Air Commerce Bureau Adopts Radio Typewriters

A SERIES of radio-operated teletypewriter machines over which weather reports can be transmitted simultaneously without the use of wires is being installed along the Washington, D. C.-Nashville, Tenn., airway route by the Bureau of Air Commerce. The machines have been in experimental use between Baltimore, Md., and Washington for the past year and a half.

The typewriters can also be installed and operated from transport planes, the weight of the machine being insignificant, particularly since it would insure against error in the receipt of weather reports. At the same time the machine provides a permanent record of the reports. Installation of the machines will cost about $200,000, but it is expected that the savings effected will make up the cost within a period of three years.

The Bureau of Air Commerce will use radio-operated teletypewriters like these to send weather reports to airports and airplanes. R. B. Ladd demonstrates device at Silver Hill, Md.

Blind Man Remodels Home



Although totally blind, M. F. Jones, of Tampa, Fla., remodeled his large five room home into a modern building consisting of eight apartments. He did all carpentry work unaided.

OVERCOMING the handicap of being blind, M. F. Jones, of Tampa, Florida, remodeled an entire house unaided. One of the features of the job was the removal of an enclosed stairway and the rebuilding of it on an outside porch. Before losing his sight, Mr. Jones had been a construction foreman.

Newsboys Wear Neon Signs

NEWSBOYS who sell the *Los Angeles Times* are supplied with small neon electric signs having the word "TIMES" in capital letters. The signs, worn at night, stand out in traffic and protect the boys against possible accidents from passing autos.

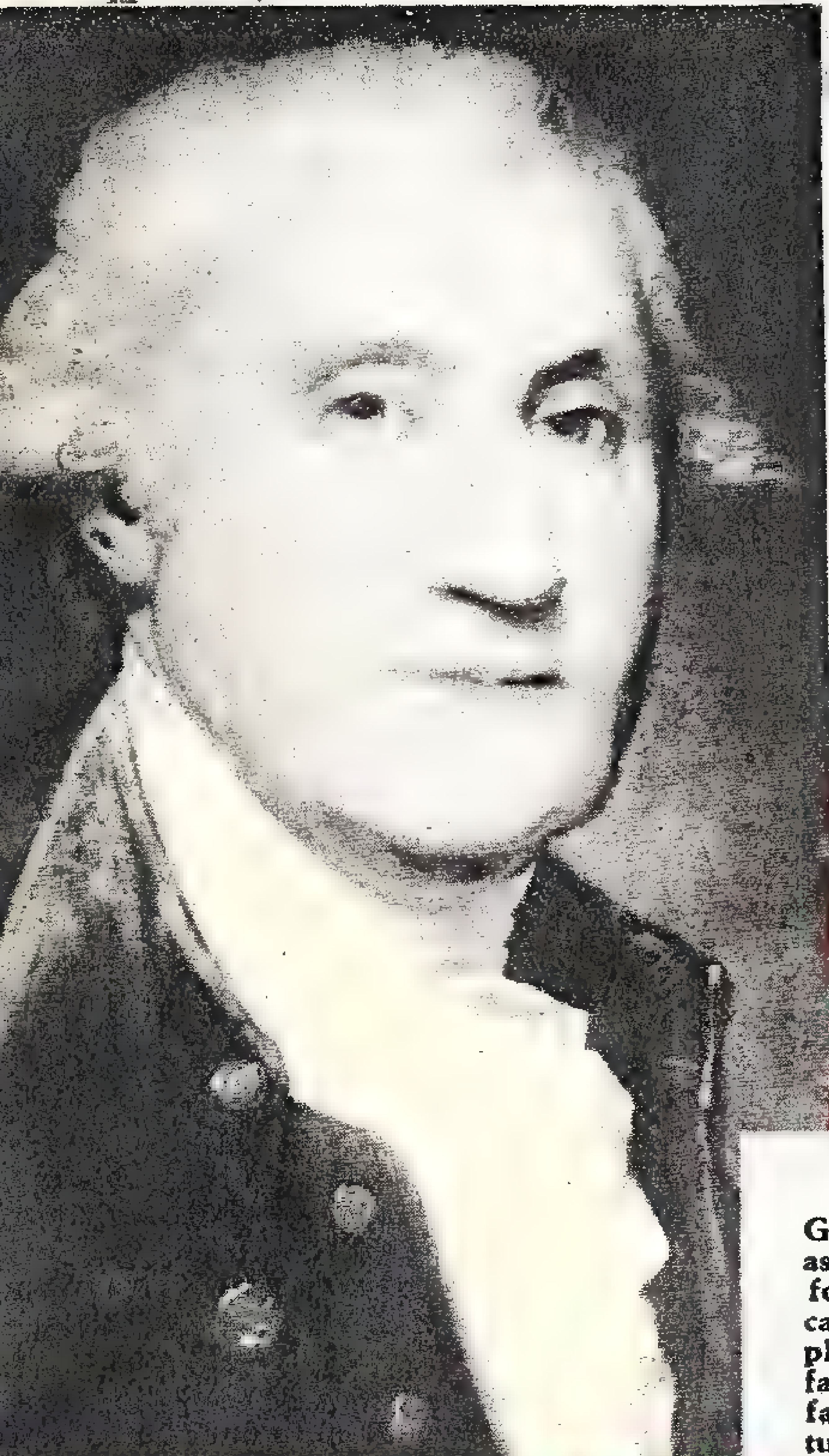
The signs were designed by A. A. Allen, an electrical engineer, and will burn steadily for 48 hours without changing the dry cell battery. These signs, besides protecting boys, attract pedestrians and increase sales.

Los Angeles
MOB FORMS AS THREE
TIMES

Powered by small dry cell batteries, neon electric signs worn by newsboys for the *Los Angeles* Daily *Times* protect them from possible traffic accidents in darkened streets and help increase sales.

GREAT INVENTIONS

by Aubrey D. McFadyen

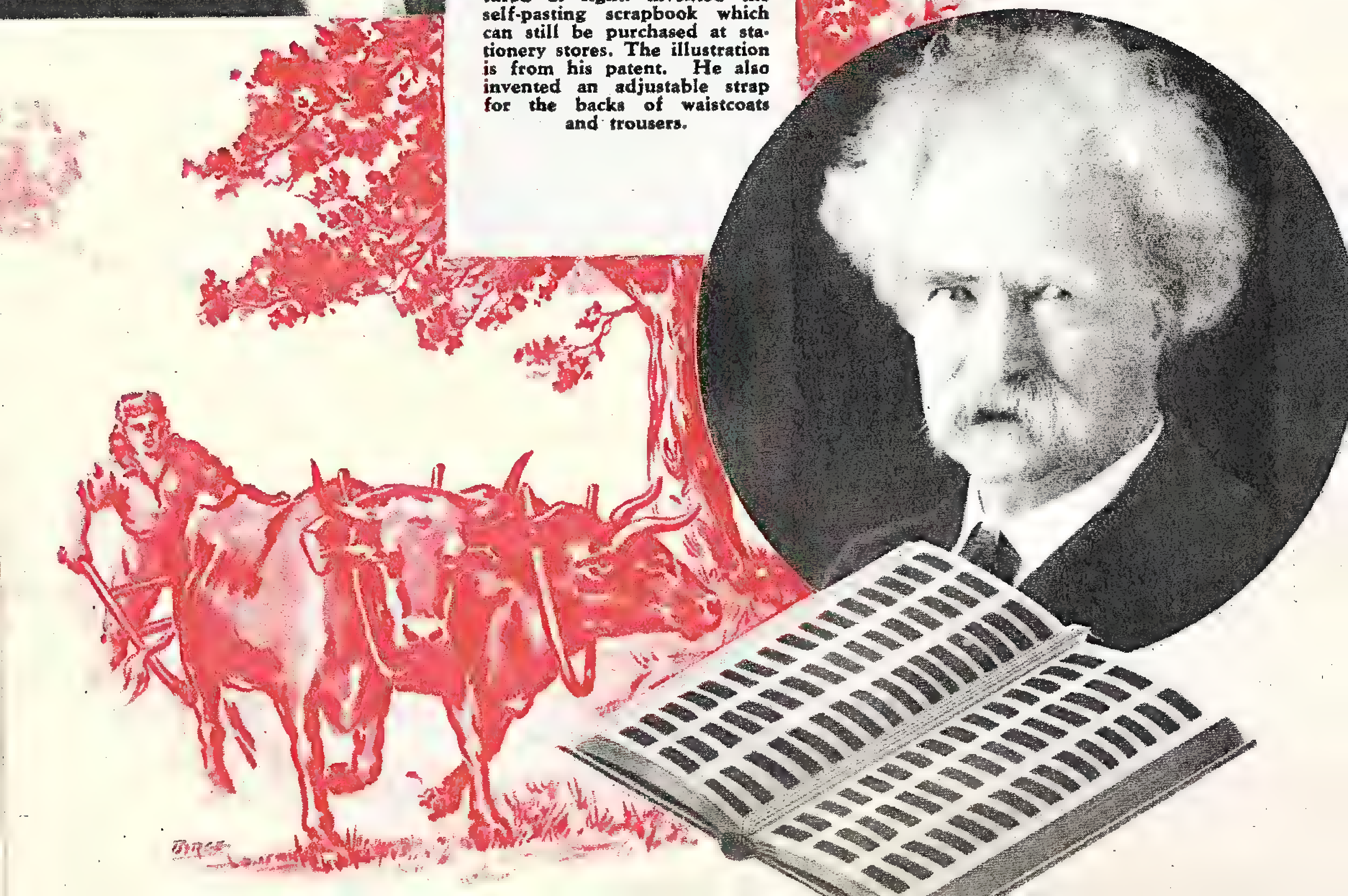


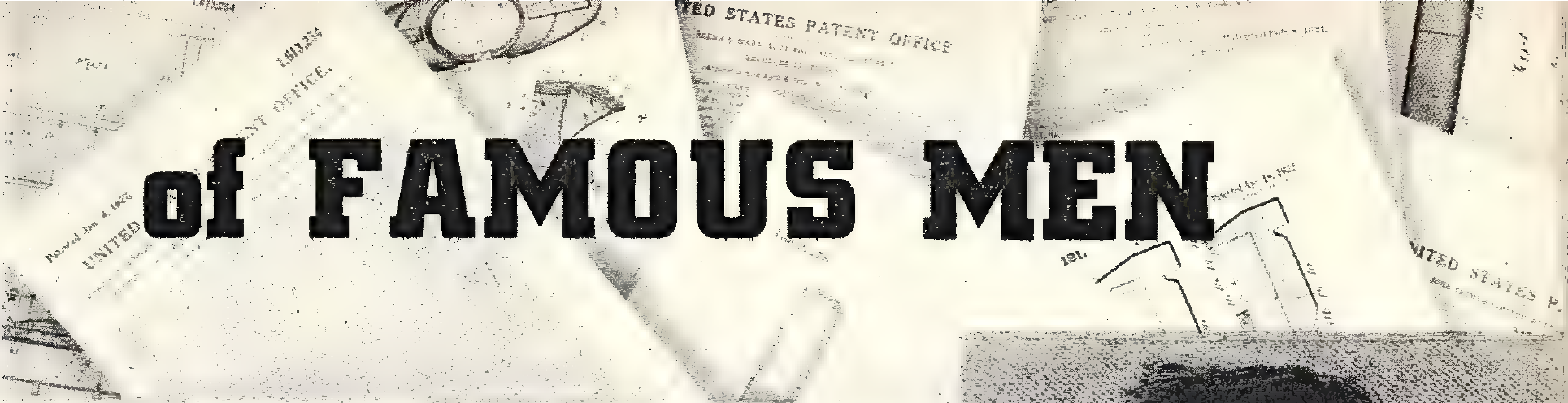
SENATOR WILLIAM G. McADOO'S fingers were burned at a picnic when he picked up a metal thermos bottle cap-cup full of hot coffee. So he went home and invented a heat-proof cap. The Senator's latest patent covers improvements in the familiar safety razor—the new razor being constructed so that the blade can be inserted or removed without taking the razor apart.

To such casual inventors the world is indebted for most of the 2,059,187 inventions patented in the United States during the 100 years existence of the American patent system, the centennial of which was observed in Washington on November 23.

Everybody, from Presidents to prisoners, has been inventing all manners of things. It excites little wonder when an eminent pianist patents numerous automobile structure, or when a pugilist patents a monkey wrench, or even when a scion of one of the nation's wealthiest families patents a shoe polishing device. The name of Dr. Albert Einstein is so much in the daily print in connection with

George Washington, pictured as painted by Gilbert Stuart, found time in his versatile career to invent a seeding plow, a wine coaster and other farm devices. Samuel Clemens, famed as Mark Twain, pictured at right. invented the self-pasting scrapbook which can still be purchased at stationery stores. The illustration is from his patent. He also invented an adjustable strap for the backs of waistcoats and trousers.

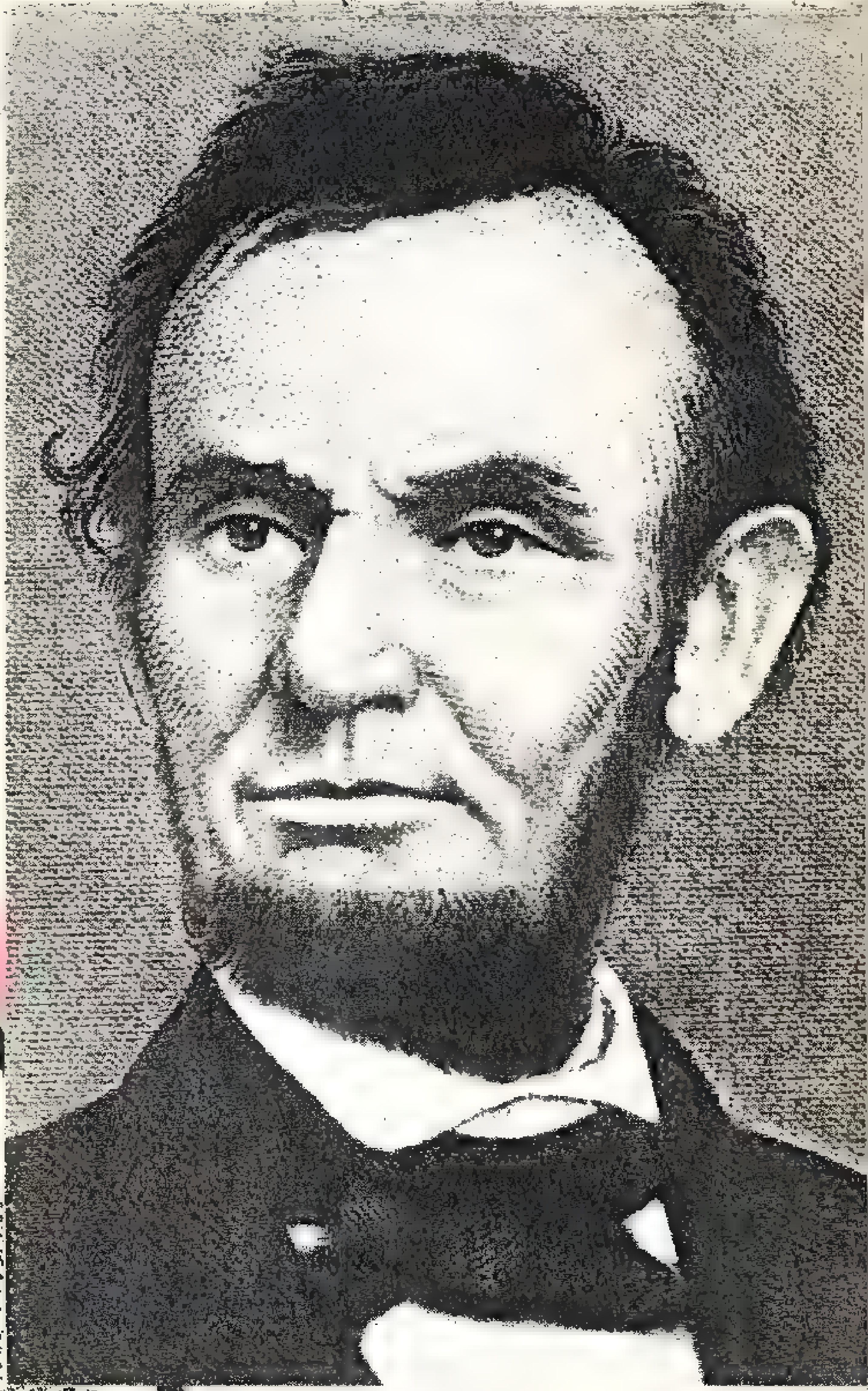




# of FAMOUS MEN

his theory of relativity that when he patents a novel refrigerating system it is not even regarded as news.

When one reads that Thomas A. Edison patented 1,101 inventions, that John F. O'Connor, Chicago railway engineer has patented 968, or that Carleton Ellis, Montclair, N. J., chemist, has patented nearly 700 inventions ,the conclusion is immediately drawn that professional inventors are the backbone of the Patent Office. Nothing is farther from the truth. Men like John F. O'Connor, Elihu Thomson, Carleton Ellis, Henry A. Wise Wood, Clyde C. Farmer, John Hays Hammond, Jr., and Ethan I. Dodds—all living inventors, each having patented over 300 inventions—are the exceptions. For every professional inventor there are hundreds of amateur or casual inventors. In fact, by reason of the inexperience of the casual inventors, and their tendency to dabble in fields in which they have little or no experience, frequently their ideas have been the more radical and revolutionary. Edmund



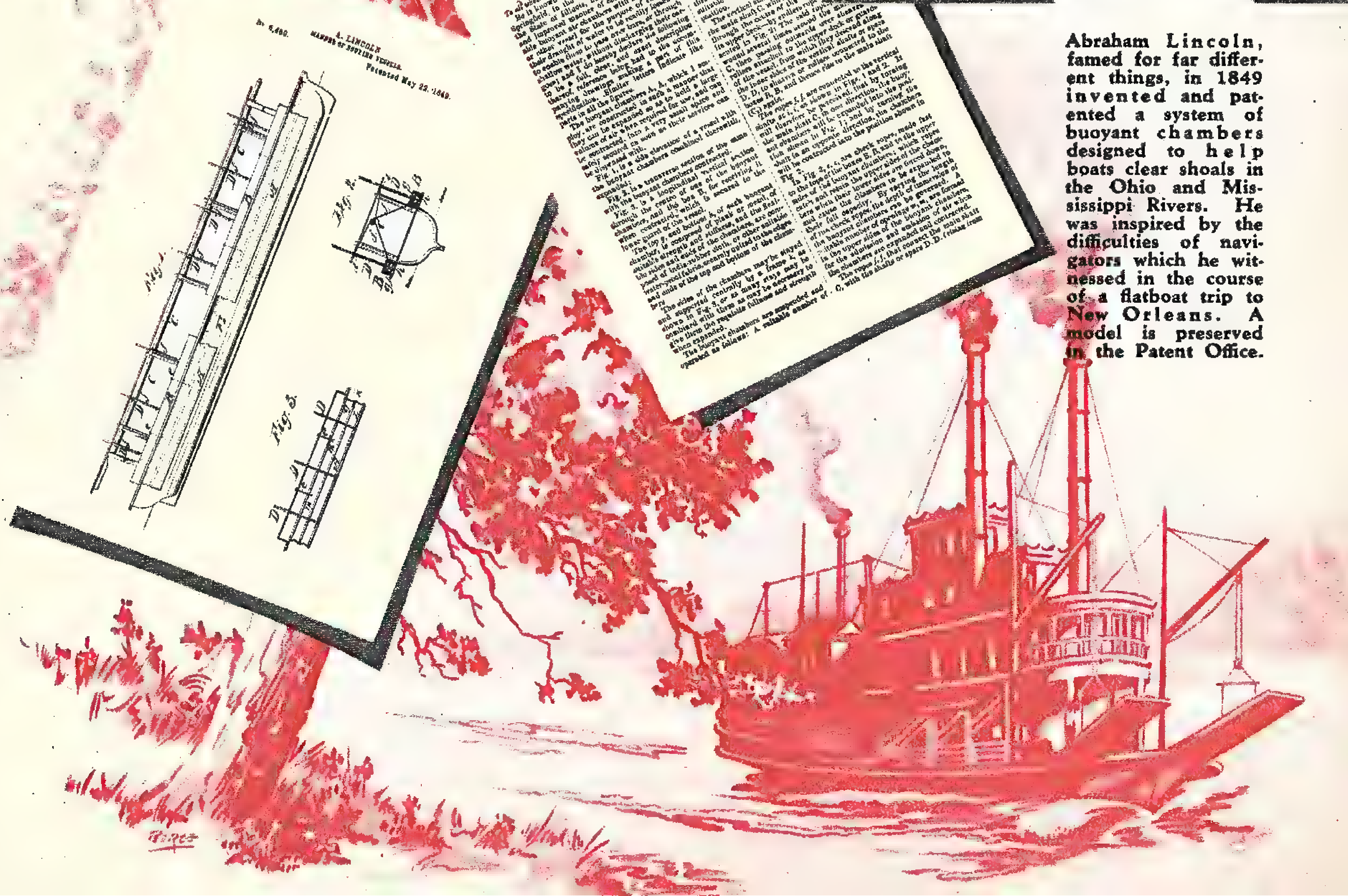
Abraham Lincoln, famed for far different things, in 1849 invented and patented a system of buoyant chambers designed to help boats clear shoals in the Ohio and Mississippi Rivers. He was inspired by the difficulties of navigators which he witnessed in the course of a flatboat trip to New Orleans. A model is preserved in the Patent Office.

UNITED STATES PATENT OFFICE

ABRAHAM LINCOLN, OF SPRINGFIELD, ILLINOIS.

BUOYING VESSELS OVER SHOALS.

Specification forming part of Letters Patent No. 6,469, dated May 22, 1849; application filed March 10, 1849.


No. 6,469.
A. LINCOLN
MANNER OF BUOYING VESSELS.
Patented May 22, 1849.
Fig. 1.
Fig. 2.
Fig. 3.

Cartwright, a clergyman and poet, invented the power loom; Eli Whitney, a New England school teacher, conceived the idea of the cotton gin while sojourning in Georgia; Richard Arkwright, a barber, invented the spinning frame; the Wright brothers, inventors of the airplane, were bicycle mechanics; Samuel Segal, inventor and founder of the lock company which bears his name, was a New York City policeman; while the automatic telephone exchange is credited to Almon B. Strowager, a Kansas City undertaker, who thought a rival had bribed telephone operators to bungle his calls!

Because of the same inexperience—many ideas of the casual inventors have not been adopted commercially. That is true, for example, of the sole invention patented by Abraham Lincoln—the original model of which is one of the few preserved by the Patent Office in Washington.

As a young man Lincoln had made the trip by flatboat down the Ohio and Mississippi rivers to New Orleans, and had noted the trouble of navigators on the shoals. After steamboats had begun to replace flatboats he conceived the idea of attaching buoyant chambers, much like huge bellows, to the sides of the boats, to be inflated or otherwise forced open by the power of the engine when the steamboat went aground on a shoal. The added buoyancy was supposed to lighten the draft of the vessel, so that it would float off the shoal.

Lincoln was not the only man to become president of the United States who did a little inventing on the side, though he was the only one to take out a patent. George Washington and Thomas Jefferson, for examples, were both inventors.

Jefferson originated the folding buggy top; also the swivel chair and the modern plowshare, to mention two still in use today. The original of another of his inventions—a writing desk with an adjustable top—is in the Smithsonian Institution at Washington. Because of Jefferson's inventive and scientific traits, the duty of passing upon applications for patent was delegated to him in the early days.

George Washington's inventions included a "wine coaster," a seeding plow, and other farm devices, all of which are

Glenn S. Warner, the veteran football coach, has patented a shoulder protector and other gridiron equipment.

William Gibbs McAdoo is an inventor as well as a Senator. He has devised a heat-proof cap for a thermos bottle and not long ago patented a safety razor improvement. Natacha Rambova, once wife of the late Rudolph Valentino, holds a patent on a combined coverlet and doll.

recorded in his diary. In the entry of March 26, 1760 we find this entry:

"Spent the day in making a new plow of my own invention."

Further entries read:

"March 27. Set plow to work and found she answered very well in the lower pastures."

"Apr. 5. Made another plow, the same as my former, except it has two eyes, and the other one."

Neither Washington nor Jefferson turned their inventions to commercial account. In those days it was considered beneath the dignity of a gentleman to accept remuneration for inventive effort. Benjamin Franklin, however, not regarding himself as a "gentleman" in the parlance of the day, did not hesitate to exploit his inventions. On his copper plate press was printed the first paper money used in New Jersey. He first devised spectacles with double lenses, for reading and distance; he also invented a mangle for pressing linen, and the renowned "Franklin stove," a sort of cast iron fireplace which could be set up in the room and connected by pipe to the chimney. It was the first heater in which most of the heat did not go up the chimney.

July 19, 1932
Plant Pat. 19

Secretary of the Interior Ickes holds a patent on the dahlia pictured at the left. Plant patents are a comparatively recent innovation at the Patent Office but since legalization six years ago over 200 have been issued.

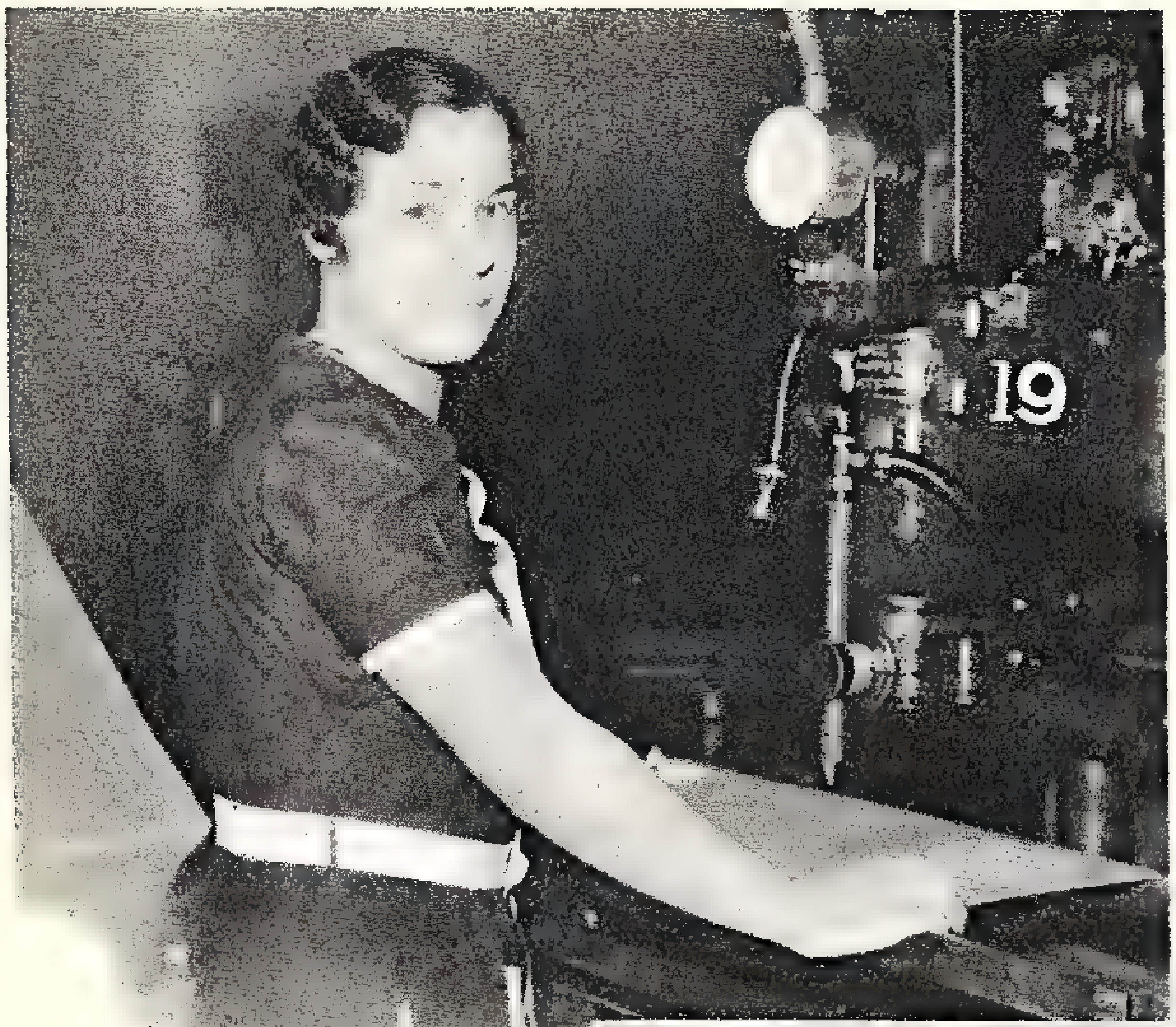
Cornelius Vanderbilt, Jr., the journalist, is recorded in the Patent Office as inventor of a shoe polishing device the size of a large fountain pen. The barrel holds the polish.

Among the American men of letters the late Samuel L. Clemens stands among the very first in the affections of the reading public, but few know that Mark Twain was an amateur inventor, and that one, at least, of his inventions made money for him—though he lost more money on another man's invention. Clemens financed an inventor named Paige, who had worked out a type-setting machine; Mark Twain's own experiences as a printer interested him in the problem. One machine was completed at a cost of $1,300,000; it is now on exhibit at Columbia University. But before Paige's machine reached the commercial stage Ottmar Mergenthaler's much simpler and cheaper slug casting machine—the linotype—was on the market, and all of Clemens' investment—$190,000, constituting most of his wealth—was lost. Dejected, Clemens wrote to the publishers of a book intended to aid inventors: "If your book tells how to exterminate inventors, send me nine editions."

Three patents were issued to Mark Twain himself, however. The first was an adjustable and detachable strap for the backs of waistcoats and trousers. Then in 1873 Clemens took out a patent entitled, "Mark Twain's Self-Pasting Scrap Book," which can still be

[*Continued on page* 134]

PROVING WOMEN ALSO HAVE IDEAS



Mrs. Sophie Baikusis, above, is the most inventive employee of the General Electric plant at Schenectady, N. Y. The widowed mother of two children, she has earned bonuses with 80 suggestions since she went to work in the radio department 9 years ago.

Miss Inez E. Matthews of Oakland, Calif., above, is the inventor of the "Ice Box" flower, widely marketed imitation flowers which freshen when refrigerated. The idea occurred to her while studying art in Paris. Though only 14 years old, Miss Jane Plant of College Park, left, worked as a "grease monkey" at the Candler Airport in Atlanta, Ga., during her vacation. As soon as she is old enough she plans an air career. Mrs. Mary Brusseau of Windsor, Ont., is shown below with the illumiphone which she has invented for telephones. It is a combination telephone stand of modern design which lights upon lifting of receiver. A two-way switch permits light to be turned on without lifting the receiver.

Queen of women inventors is Miss Beulah Louise Henry of New York, above. She has earned the title of "Lady Edison" with 43 patents in the past decade for inventions ranging from dolls to sewing machines. One of her most unusual products is a snap-on parasol which permits a woman to have an umbrella to match each frock. She also has devised many things for the aid of office workers.

Pilot Uses Inflated Suit On Record Altitude Hop

WEARING a specially designed high altitude flying suit and piloting a Bristol 138 airplane equipped with a supercharged Pegasus engine, Squadron Leader F. R. D. Swain, of the Royal Air Force, established a new world's altitude record of 49,967 feet at Farnborough, Hants, in England.

The flying suit worn by pilot Swain consisted of a rubberized fabric oversuit fitted with a helmet of the same material in which a curved double-glass window was fixed. The suit, when inflated, was designed to maintain normal atmospheric pressure on the lungs of the wearer regardless of altitude. Squadron Leader Swain was complimented by King Edward VIII, for setting a world's record. It was necessary for him to surpass the French altitude record of 48,698 feet by a margin of at least 984 feet to obtain recognition of his new record.

Above—The figure in the airplane is not a robot pilot despite its mechanical appearance. It is Squadron Leader F. R. D. Swain returning from the altitude flight in which he attained a height of 49,967 feet, establishing a new world's record. Pilot Swain is wearing the specially designed inflated flying suit that helped maintain normal atmospheric pressure on his body despite altitude. Right—A close-up of Squadron Leader Swain and rubberized oversuit he wore on the flight.

Pullman Cars Go Modernistic

The new Pullman observation cars are roomy and comfortable. Steel alloy bodies and aluminum alloy interiors, comfortable seats, venetian blinds, and indirect lighting are featured.

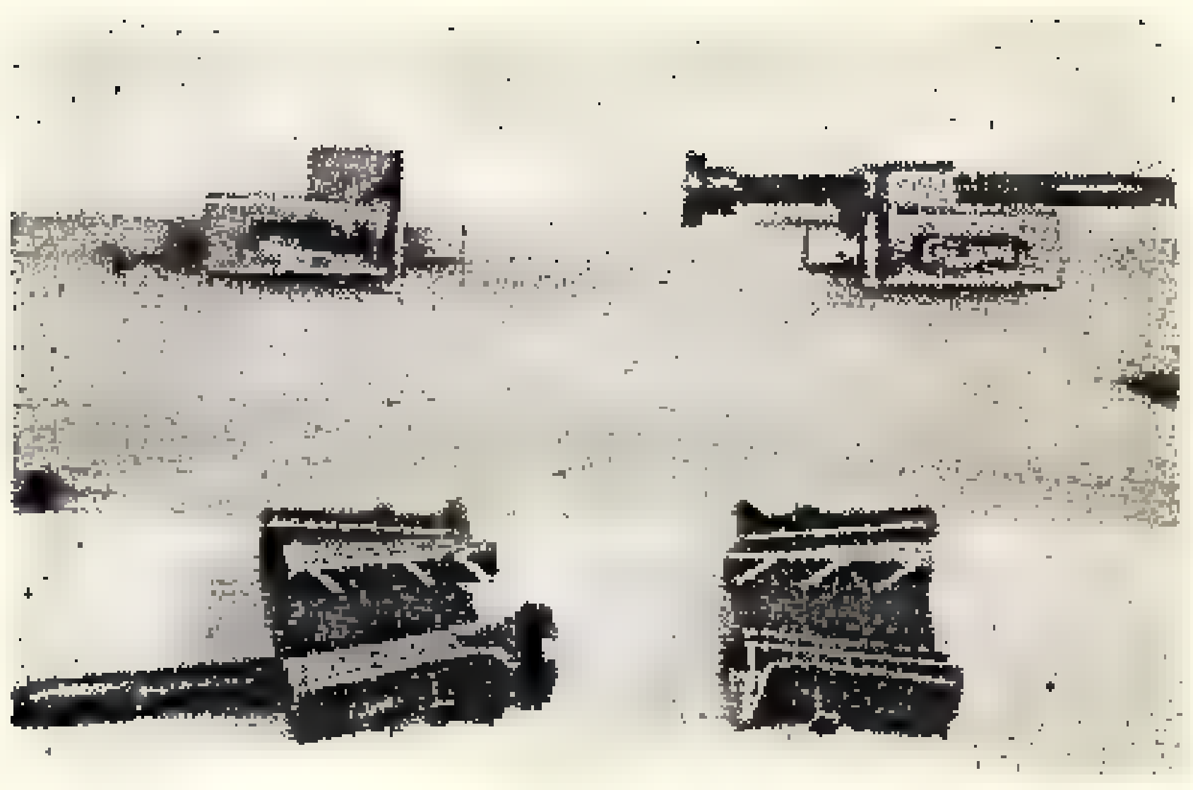
COMFORTABLE modernistic furniture and indirect lighting for night reading purposes are features of the new steel and aluminum alloy Pullman observation cars. A buffet containing a broiler, coffee urn, and a refrigerator is also featured.

An observation parlor seating six persons is located at the rear round-end of the car, and a lounge seating 20 persons on sofas and seats occupies the remaining car space.

Saddle Clamp Is Removable

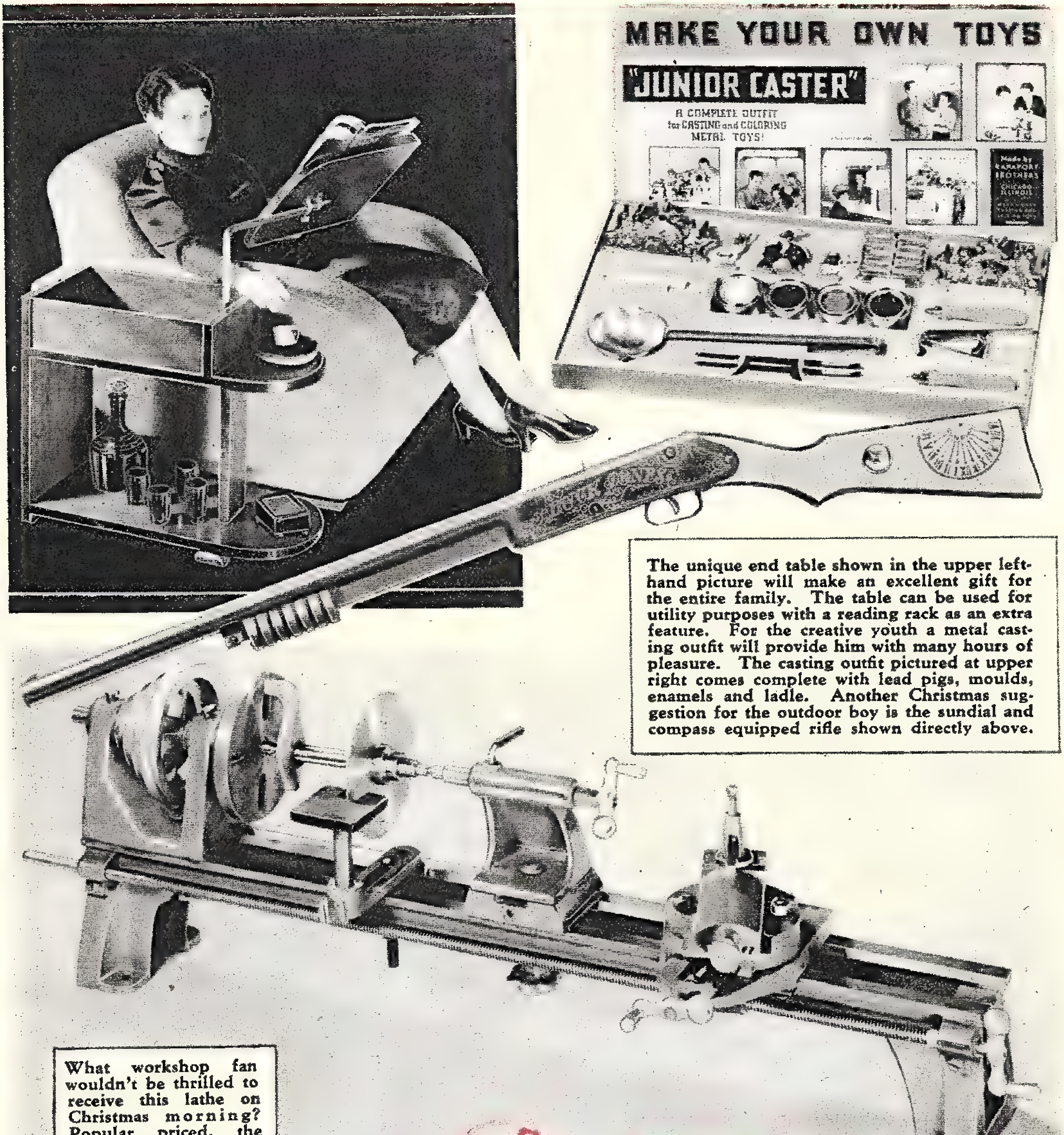
COMPOSED of two saddles, each drilled and tapped for a feed screw, a removable workshop clamp has been developed by C. P. Stuart, of Gorham, New Hampshire. Each saddle has two wedged shape jaws with three diagonal teeth that bite into the wood or metal beam to which the clamp is to be attached.

Each of the wedges has a pawl attached to its backside which engage teeth in the side of the saddle. This maintains the saddle in position while being used. The pawls can be turned half around enabling the user to remove the clamp after stress is removed by simply bumping the back of clamp.



This removable saddle-clamp device can be used two ways—as a clamp for holding work together, or as a jack to force work apart.

Last Minute Gift Suggestions



The unique end table shown in the upper left-hand picture will make an excellent gift for the entire family. The table can be used for utility purposes with a reading rack as an extra feature. For the creative youth a metal casting outfit will provide him with many hours of pleasure. The casting outfit pictured at upper right comes complete with lead pigs, moulds, enamels and ladle. Another Christmas suggestion for the outdoor boy is the sundial and compass equipped rifle shown directly above.

What workshop fan wouldn't be thrilled to receive this lathe on Christmas morning? Popular priced, the lathe features several new attachments which are usually found only on the more expensive metal turning lathes.

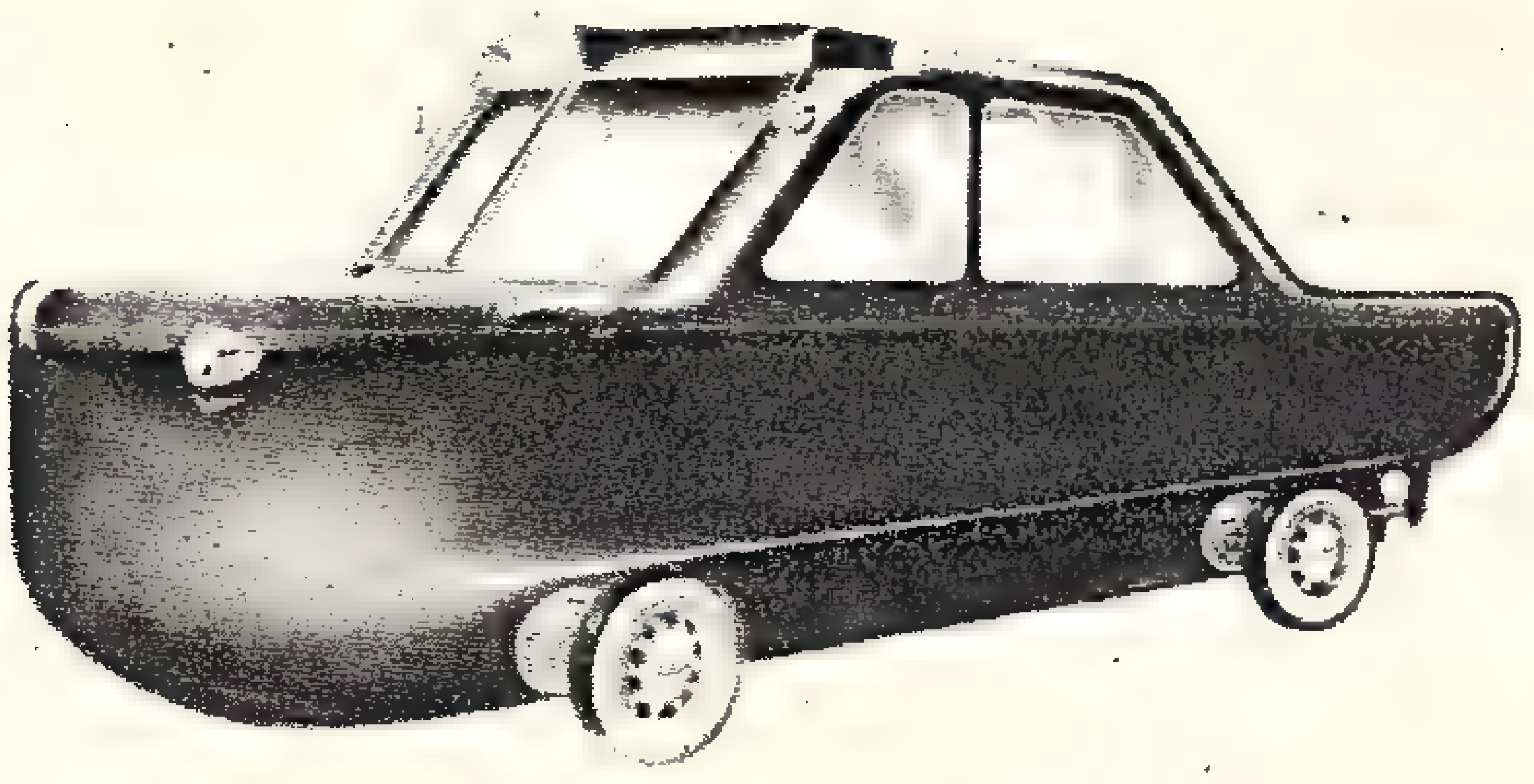
This is not a pedal-car, but a real miniature automobile with a gasoline motor. Provided with real balloon tires it is the first midget in low priced field.

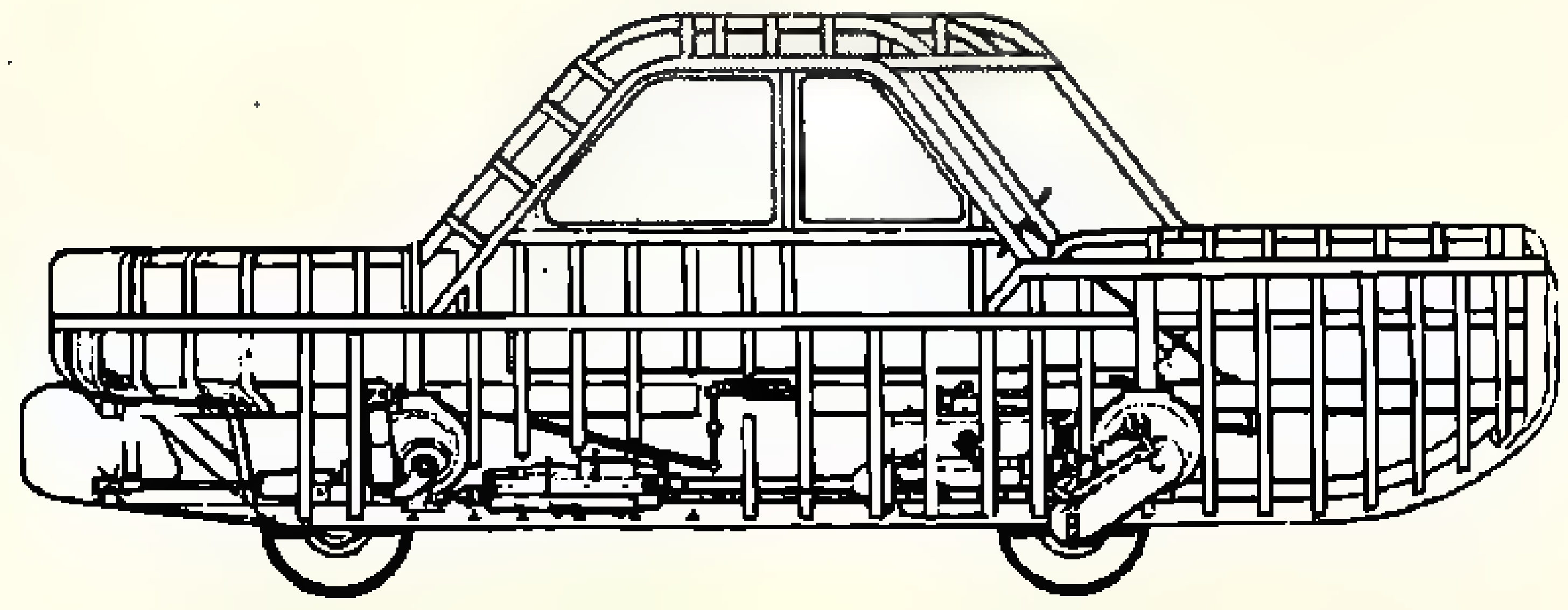
Auto-Yacht Features Aluminum Hull Construction

POWERED by a standard automotive-marine type engine, an aluminum Auto-Yacht has been invented by Roy Applegate, of San Francisco, Calif. Its construction combines a home, auto, and yacht.

The cabin is furnished like an apartment with sink, electric cooking stove, radio, electric refrigeration, etc. The windows are non-shatterable and can be made water-tight by means of wing nut adjustable bolts.

All wheels steer by use of specially designed equipment and can make a perfect arc when turning. In the event of a long water cruise, the wheel assembly can be easily removed and replaced with plain smooth plates. Twin screw propellers motivate the Auto-Yacht when used in the water.





Top-The Auto-Yacht invented by Roy Applegate of San Francisco, Calif. Built mainly of lightweight aluminum it incorporates the advantages of auto and boat. Bottom—Plan view.

Blow Torch Thaws Switch

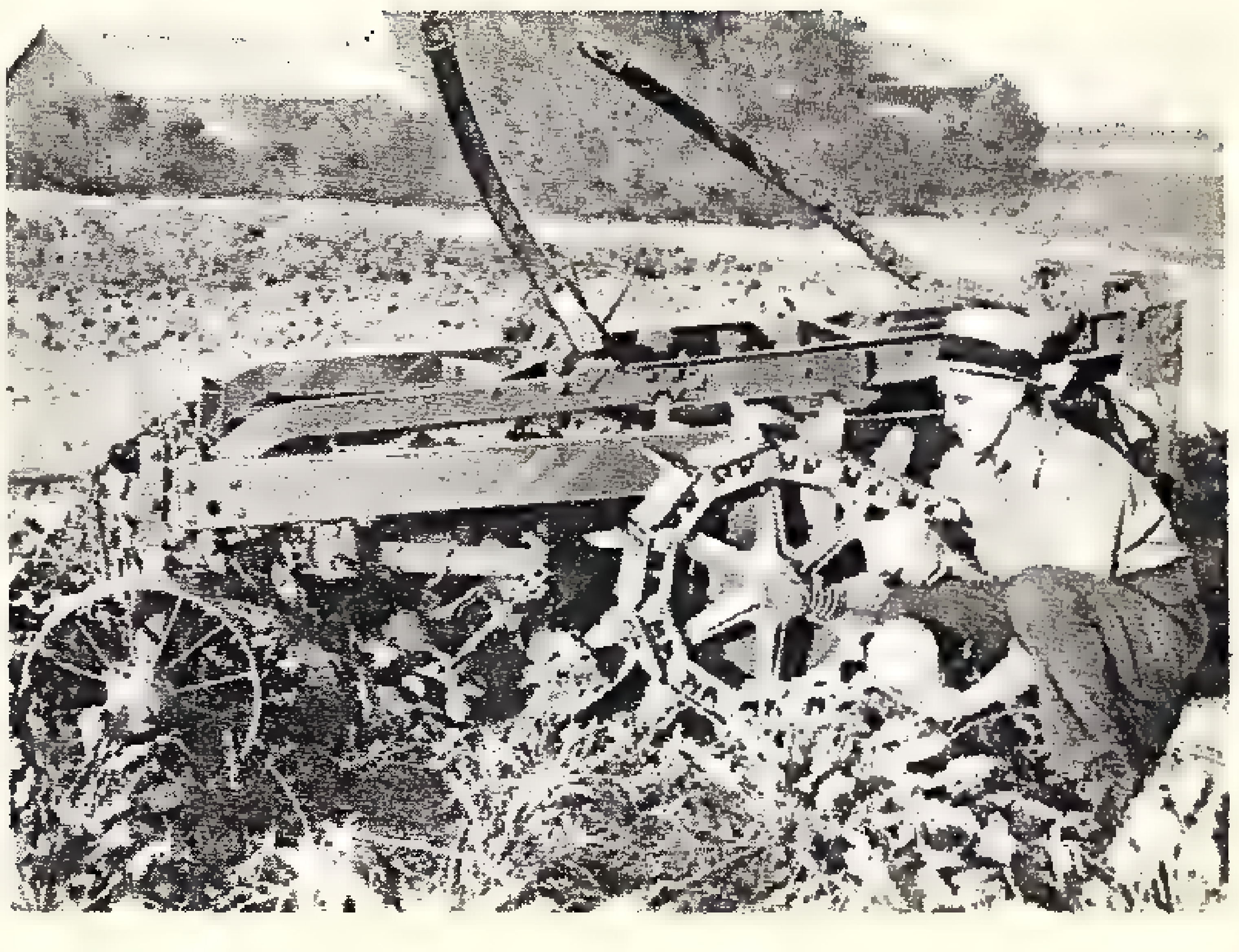
Developed in cooperation with the U. S. Forest Service this gasoline blow torch has an overall length of 41 inches. It is used to destroy weeds along tracks and to thaw frozen switches.

THAWING frozen railroad switches is quickly accomplished with a new blow torch developed by Turner Brass Works, Sycamore, Ill. The device shoots a hot blue flame downward at the ground for 2½ hours on a tankful of gasoline.

Machine Aids Beet Farmers

WEIGHING 3,000 pounds, a new machine developed by John Devey, Jr., of Glendale, Calif., may revolutionize beet farming. In one operation the new machine slices the tops from the beets and digs them from the ground at a speed that is 60 times faster than the job can be done by hand workers. Neatly topped, the beets are laid on the ground ready for loading.

The application of the device to beet farming is expected to reduce the farmer's production cost inasmuch as fewer hired hands will be needed to harvest the usual crop. It will also shorten the farmer's work day.



This beet farming machine slices tops off beets and digs them from ground 60 times faster than can be done by hand labor. John Devey, Jr., of Glendale, Calif., invented the device.

AROUND the WORLD

by H. R. Ekins

First Man to Circle Globe Via Air Lines

IT TOOK a flight around the world, entirely by air, to bring home to me the tremendous strides made by commercial aviation in the last ten years. For me the journey of little more than 18½ days, during which I flew a route of approximately 26,000 miles, was a study in aviation as it is today compared to what it was only a few years ago.

On my journey I used eight aircraft in all. The first was the German dirigible Hindenburg, the latest development in the science of lighter-than-air craft. The designers, builders and operators of the Hindenburg expect, however, that soon it will be surpassed by new giant ships of the air.

The other seven aircraft were of the heavier-than-air type. Three were used in the United States. They were twin-motored Boeings of the United Airlines and Douglas DC-2's of TWA—Transcontinental and Western Airways. The three planes which took me all the way from Frankfort, Germany, to Manila were made by Douglas, and the long trans-Pacific hop was aboard Pan-American Airways' "Hawaii Clipper," the big four-motored flying boat built by Martin and powered by Pratt and Whitney.

The aircraft listed above are the most modern and most efficient available to the civilian traveler. The study in contrasts. in-

By AIR

sofar as airplanes were concerned, began at Frankfort when I boarded a big Douglas airplane operated by KLM—Royal Dutch Airlines.

Six years ago, when I was flying around the Far East as a war correspondent for the United Press, the most powerful of the air-cooled radial engines of the Wright Cyclone type, were rated at about 525 horsepower.

In 1930 it was believed, on the basis of experience and research with the material then available, that it would be decidedly impractical to build an engine rated at more than 600 horsepower and still maintain even a vestige of dependability. Dependability in those days meant an engine that would operate for 250 hours between routine overhauls. By 1931 the power of the Wright Cyclone was increased to 575 horsepower by using slightly larger cylinders to obtain increased cubic inch displacement. During the same year advances in metallurgy and knowledge led engineers to believe that they had underestimated the possibilities of engines of the radial type.

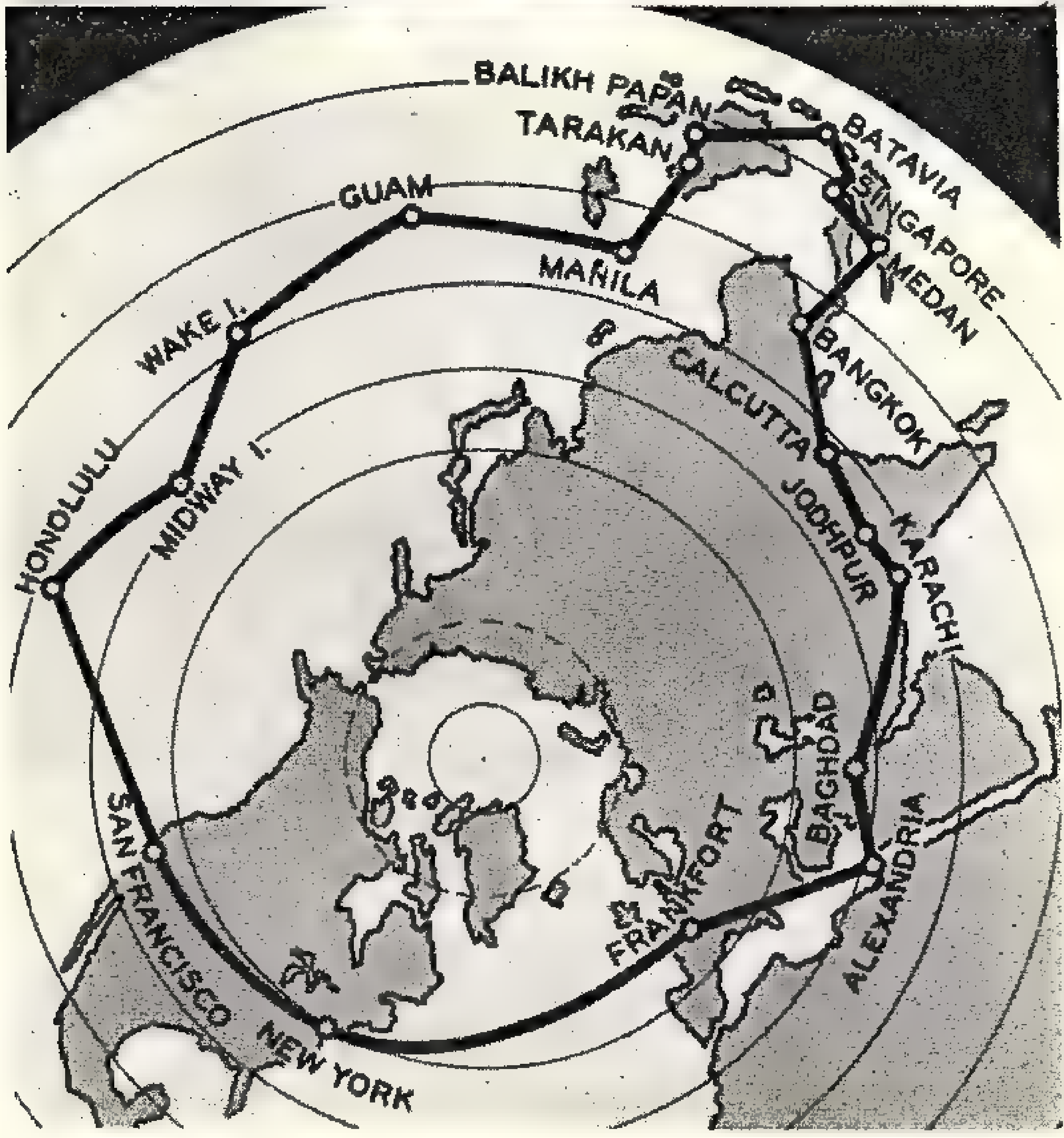
To jump a bit to the advances which had been made by the time I was ready to take off from Frankfort for the Orient I should like to point out the following:

All the way from Frankfort, Germany, to Batavia, Java, flying in only two planes, I flew behind 890 horsepower F-50 Cyclone engines. The plane of the Royal Netherlands-Indies Airways, which took me from Batavia, Java, to Manila, was powered with 715-horsepower Cyclones. When TWA flew me across the continent on the last leg of the journey they used a Douglas plane,

K-L-M
KONINKLYKE LUCHTVAART MAATSCHAPPY
PH-AKK

Above—The TWA Douglas transport plane that carried Ekins part way on his round-the-globe dash. Right—Ekins being congratulated by Miss F. W. Wilkins, TWA plane hostess, upon completing his race at Newark, N. J. Below—Dutch (K-L-M) Airline Douglas transports carried Ekins from Frankfort, Germany, to Batavia, Java.

Above—The German airship, Hindenburg, over N. Y. City. Ekins started his now famous trip from Lakehurst, N. J., aboard the giant dirigible on Sept. 30. Little more than 18½ days later, he circled Lakehurst in a TWA transport plane en route to Newark, N. J., having girdled the globe.



The route followed by Ekins on his record making flight, using only commercial airlines, is graphically shown above. The safety and comfort of American airplanes was Ekins' outstanding impression of the flight.

the Sky Chief. It was powered with F-50 Cyclones of an 890-horsepower rating.

The series F engines go back to 1932 when the Wright Aeronautical Corporation announced the development of engines rated at 700 horsepower at sea level. They weighed only two-tenths of a pound per horsepower more than the one pound per horsepower weight which the late Thomas A. Edison said was ideal for an aircraft engine. The success of the Cyclone F was immediate.

Its first commercial application was in the fleet of Douglas Airliners with which TWA equipped itself in 1934. The American and Eastern Airlines followed suit. Strangely enough, most of this I learned while flying with Dutch pilots across Europe, the Near East, and India to the Far East.

While flying over scorched, monotonous deserts I learned that in 1934 the leaders of Dutch commercial aviation were following developments in America closely. KLM negotiated with TWA to purchase one of its ships. TWA had the Douglas production tied up with priority rights.

The Dutch got their ship. Cyclone powered, it was used by two KLM pilots, Parmentier and Moll, in the McRobertson London-to-Australia air derby that involved 12,000 miles of flying. They took second place in the speed race and first place in the handicap division. By the time the race was over KLM had ordered a fleet of Douglas planes, all powered with Wright Cyclones.

The performances of Cyclones in Douglas airplanes used to establish records both in this country and abroad caused the Douglas Company to standardize on the Wright Cyclone engine for airliner installation. Of

more than 150 Douglas airliners now in use only one, I believe, is powered with other than the standard engine.

It was the dependability of airplane engines that impressed me most as I flew around the world. I was actually in the air 8 days, 10 hours and 26 minutes, and to a man anxious to get home swiftly, yet safely, the matter of dependability was of utmost importance.

The motors behind which I flew in my early days as a passenger in airplanes would run dependably for only about 250 hours before overhaul. Now they will run at least 400 hours. Dutch engineers, great enthusiasts for American airplane power plants, told me that operation of 700 hours without overhaul is possible.

Several developments, I found as I flew, are responsible for the high efficiency of the mechanical facilities which enabled me to get around the world as fast as I did. They included the dynamic damper, a patented development removing all vibration from the engine. There were also improvements in cylinder head designs and better cooling which marked an important step towards increased power. In this connection we can look forward to further advances in supercharging which will allow greater power,

[Continued on page 150]

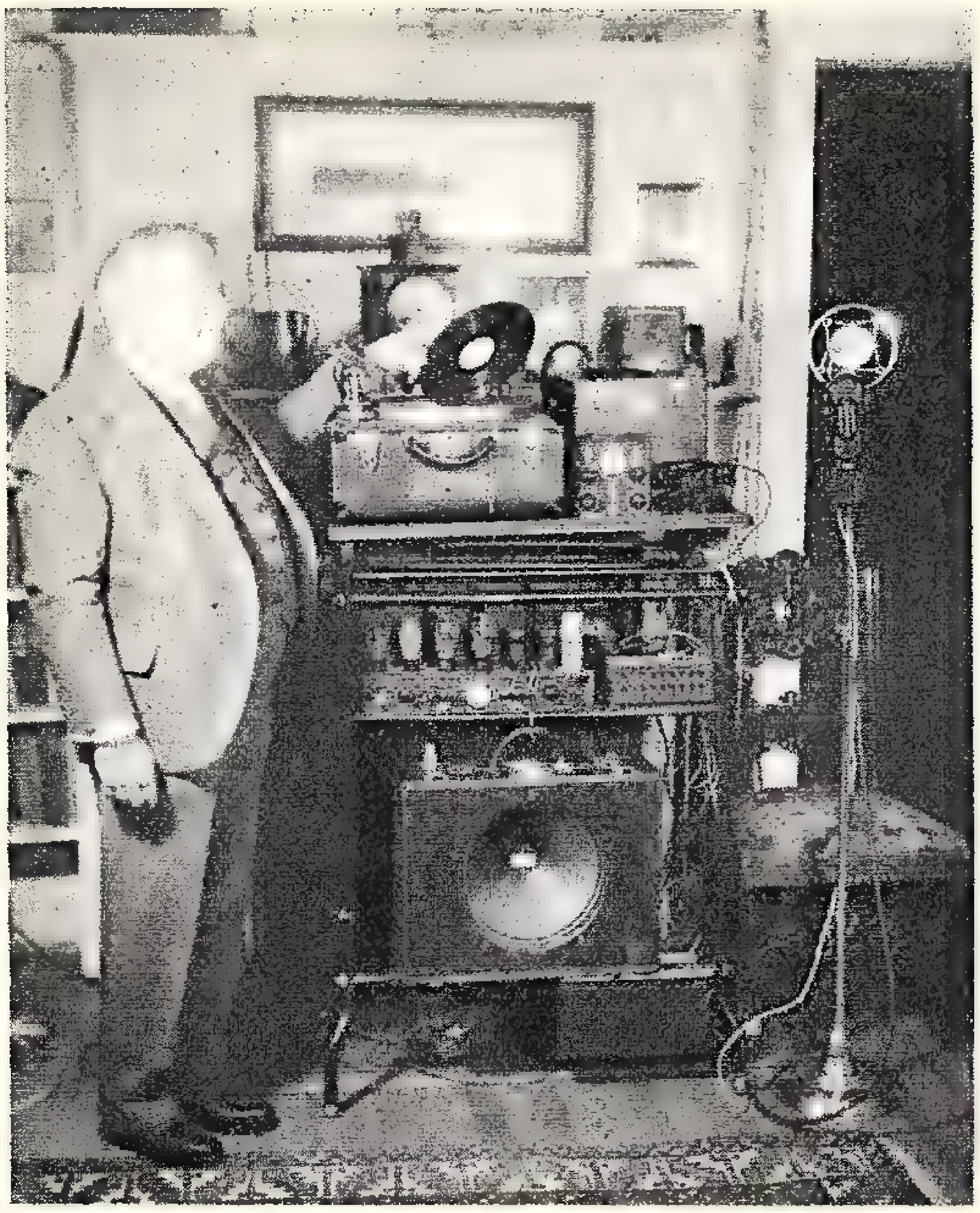
American airplanes equipped with Hamilton controllable pitch propellers like these above were instrumental in enabling Ekins to set a world's air travel record. They permit short takeoffs, maximum speed.

KLM
ATSCHAPP
P

Ekins, 4,000 miles ahead of his racing rivals, shakes hands with the Dutch (K-L-M) Airline pilot who flew him from Athens, Greece, to Batavia, Java. Dutch airlines favor American airplanes and engines.

TWA
THE
LINDBERGH LINE
TW

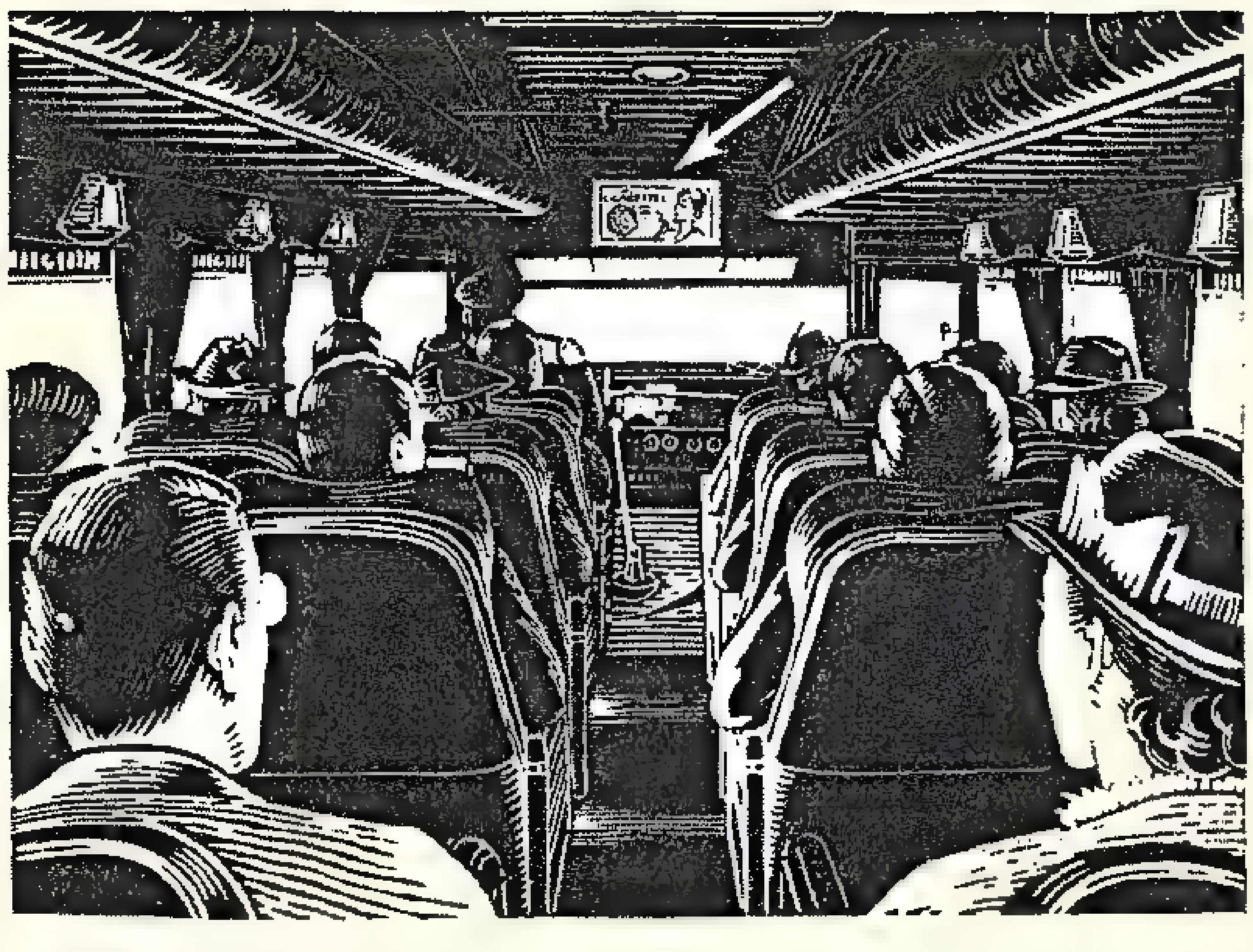
Above—Completing a flight of almost 26,000 miles in 18½ days, Ekins steps from a TWA Douglas transport at Newark, N. J., with a world's record for fast travel, using American aircraft most of the way.



A violinist can play his own accompaniment and make a phonograph record to prove the unusual feat with this device, invention of Prof. Vladimir Karapetoff of Cornell University.

Bus Ads Shown On Screen

REALIZING the need for an advertising medium in transcontinental busses, Joseph E. Houck, a San Diego, Calif., advertising man set about to design a device that would meet the special requirements of modern busses. Since placards were unsuitable, due to lack of space for mounting, he struck on the moving picture projector idea. National advertising matter photographed on Technicolor film and projected on a transparent screen was the answer. Two thousand busses will be equipped with the device.



Installed over driver's seat this new advertising medium for busses projects advertising and movie scenes on a transparent rubber screen. Inventor is J. E. Houck of San Diego, Calif.

Russian Invents Double Recording Discs

A VIOLINIST playing his own piano accompaniment or a vocalist harmonizing as a trio may sound incredible, but it is quite possible according to Professor Vladimir Karapetoff of Cornell University. The eminent Russian scientist has perfected a device which makes it possible to record as many as three different instruments or voices on a single phonograph disc.

Provided with earphones, a violinist can accompany a piano rendition previously played by himself. When the recording is played back both violin and piano will harmonize. It is possible for the musician to add a third instrument to the recording, producing a stringed trio rendition. A singer who can sing alto, mezzo soprano and soprano can blend her voice into a trio when recorded on the unusual apparatus. Prof. Karapetoff's instrument uses regular home recording blank discs which are cut with a special electric pick-up. Records are played through an amplifier.

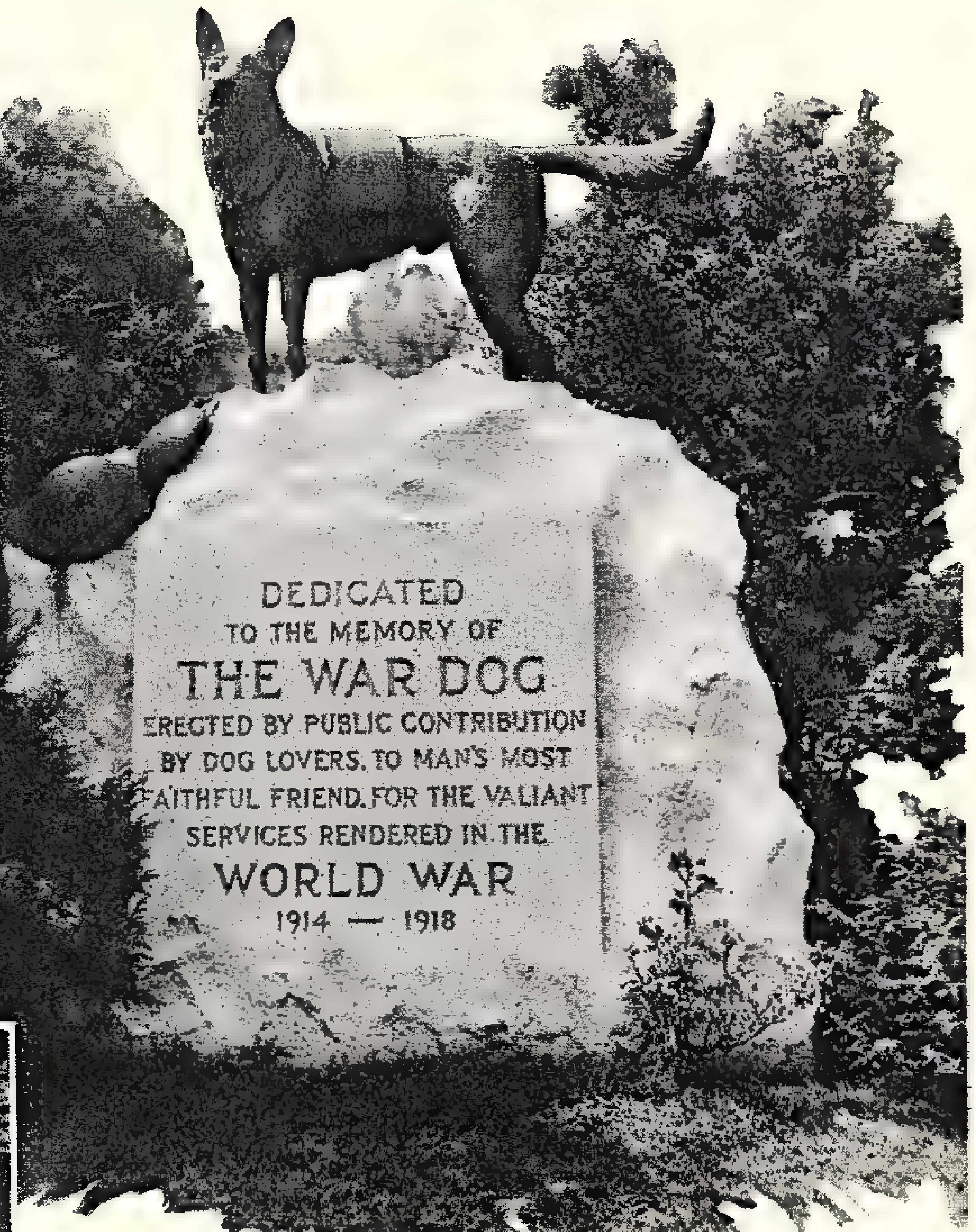
M·M·Memory Testers

How many of these questions can you answer? After testing your skill turn to page 130 for the correct answers.

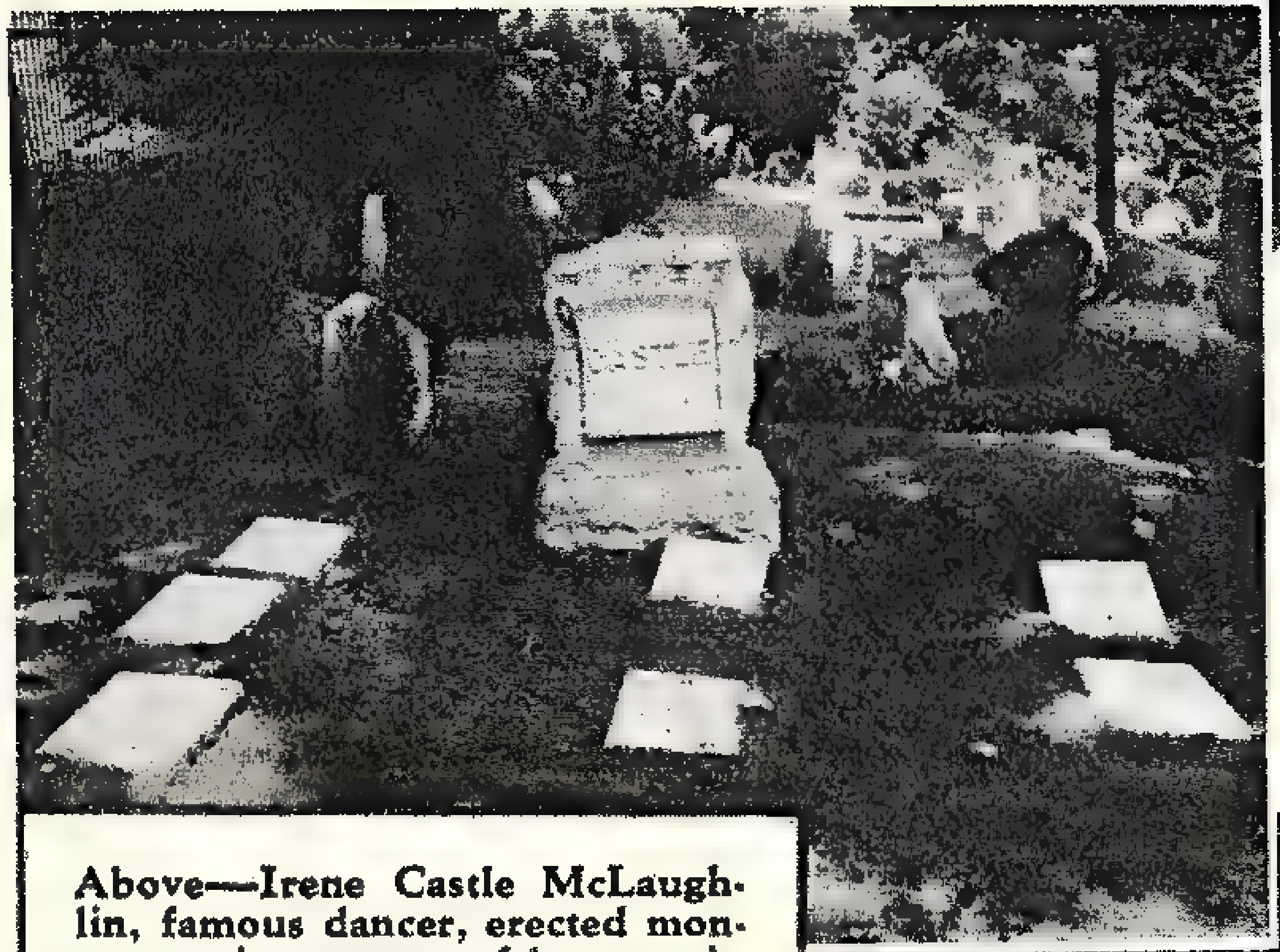
1. What purpose does a rectifier serve in an alternating current circuit?
2. Is it possible to weigh air, or doesn't it have weight?
3. What is a hydraulic ram and for what purpose is it used?
4. Name the two kinds of energy and tell the difference between the two?
5. Why are gold and silver coins produced on a punch press instead of being cast in a foundry?
6. Does sound travel faster through the air than it does over electric wires?
7. What is a Centrifuge? For what purpose is it used?
8. In what manner is the Wheatstone Bridge used in electrical work?
9. Can nickel, zinc and copper be magnetized or, if just one can be, which?
10. What holds a so-called vacuum cup to the article to which it is stuck?
11. If two strips of metal, one aluminum and the other copper, are heated simultaneously, which will expand the most?
12. Can a liquid be cooled to a temperature lower than its freezing point without having it solidify?

LOVE OF MAN FOR DOGS EXPRESSED IN BUILDING CANINE CEMETERIES

Circle—Pets of Princess Lobanoff are buried under this monument in an island dog cemetery in the Seine River, near Paris, France.


DEDICATED
TO THE MEMORY OF
THE WAR DOG
ERECTED BY PUBLIC CONTRIBUTION
BY DOG LOVERS, TO MAN'S MOST
FAITHFUL FRIEND, FOR THE VALIANT
SERVICES RENDERED IN THE
WORLD WAR
1914 — 1918

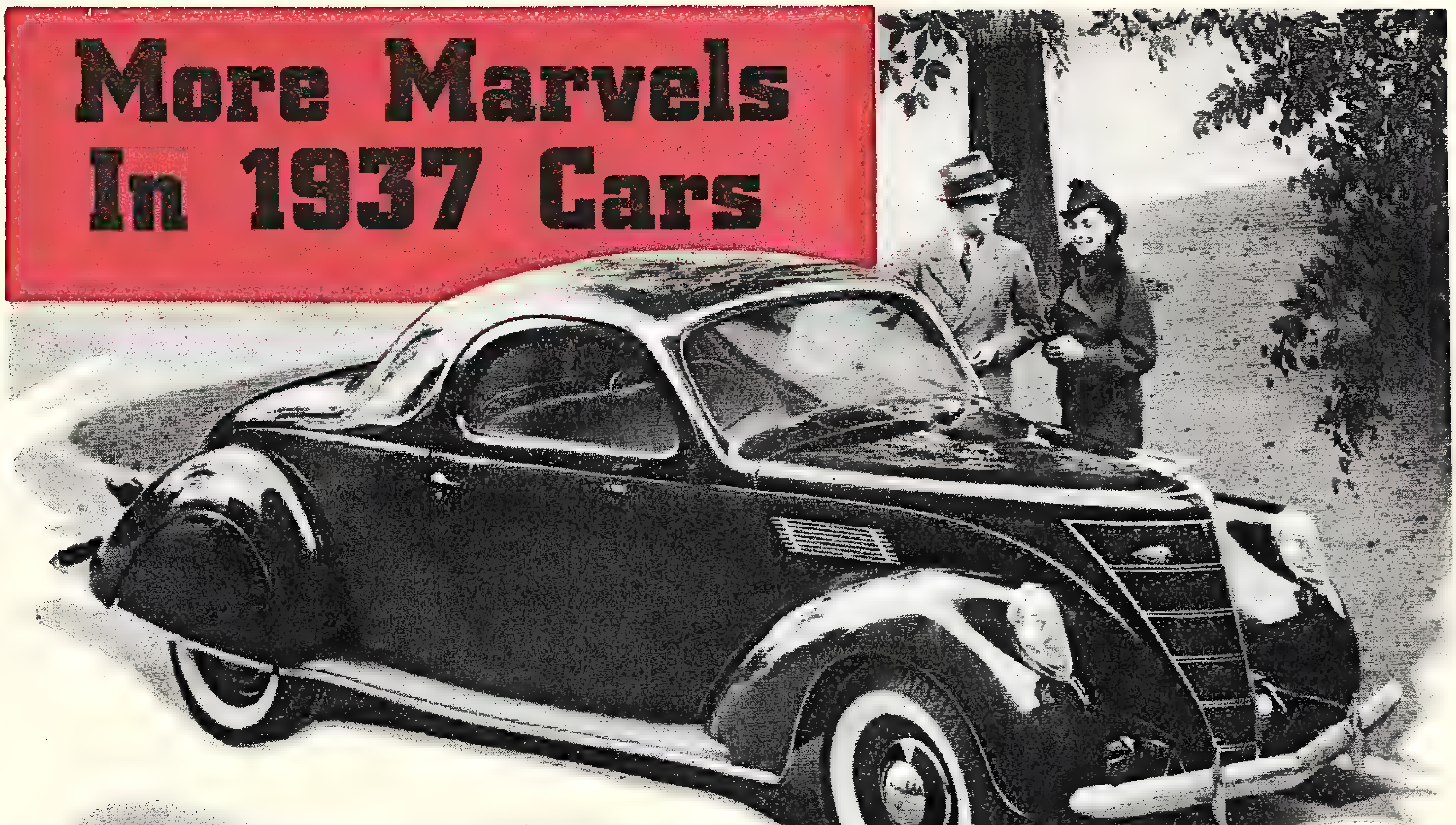
Man's gratitude for the unselfish companionship of dogs extends even to the grave. Above—A tombstone in the dog cemetery at Hartsdale, N. Y., built in memory of dogs who gave their lives in military service during the World War.



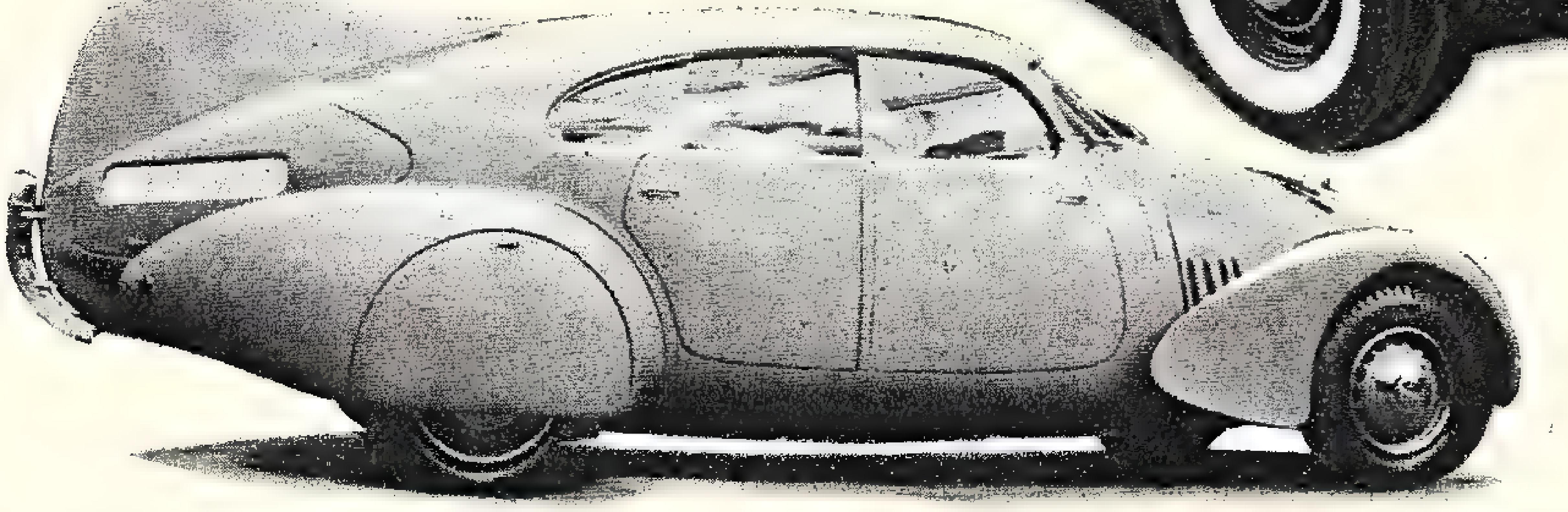
Above—Irene Castle McLaughlin, famous dancer, erected monuments in memory of her pets in the dog cemetery at Hartsdale, New York. Below—Pine Ridge Dog Cemetery, Dedham, Mass.

Above—Love of dogs who endeared themselves to their masters is universal. Here are two Japanese dog lovers visiting the grave of their pet at one of Tokyo's three dog cemeteries.

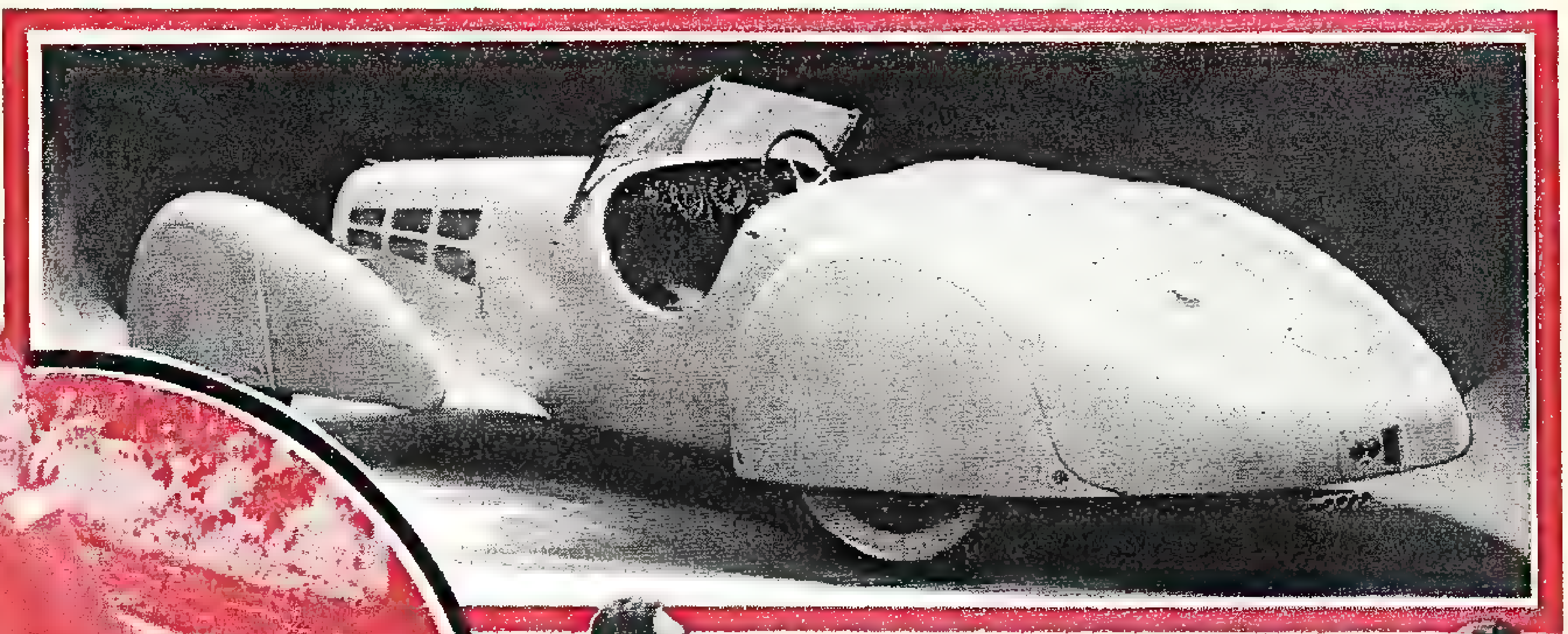
More Marvels In 1937 Cars

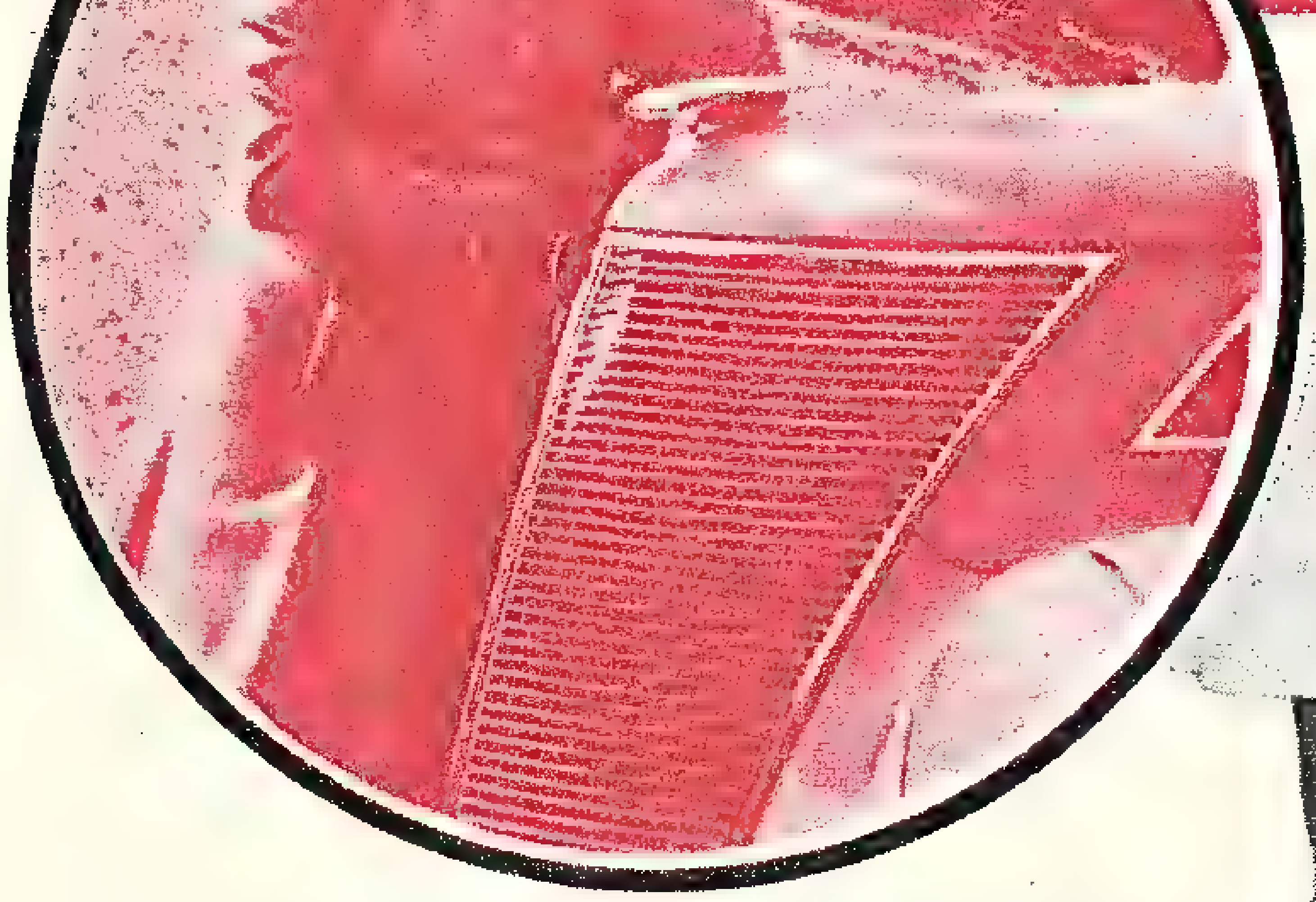


Lincoln's first Zephyr type coupe has striking lines modifying the air-stream upper body of last year's six-passenger cars. The coupe's single seat is amply wide for three passengers.

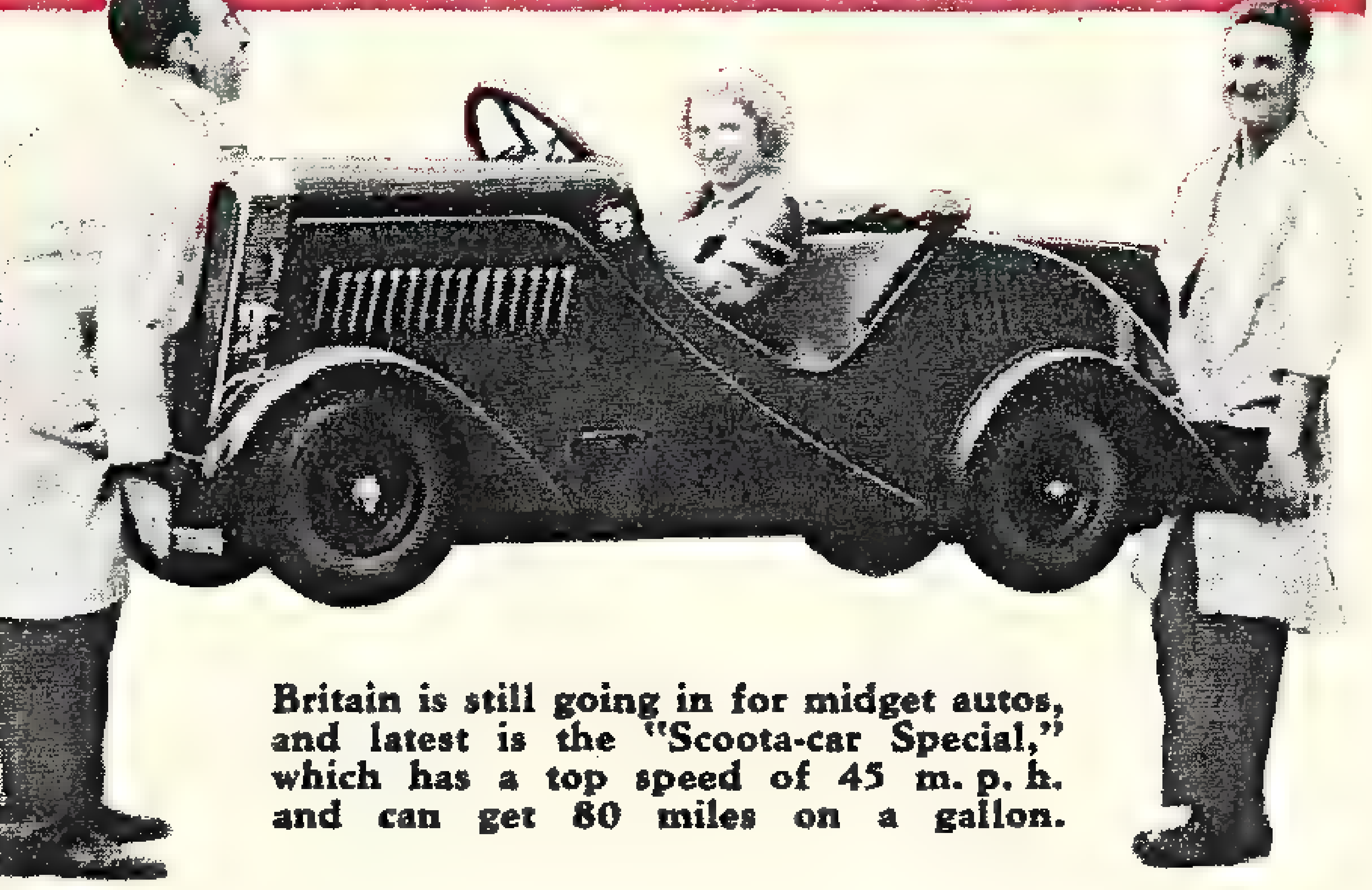


Resembling the latest planes, France's Peugot, above, attracted wide attention at the Paris show; also featuring an aerodynamic design was Italy's Bugatti, right.





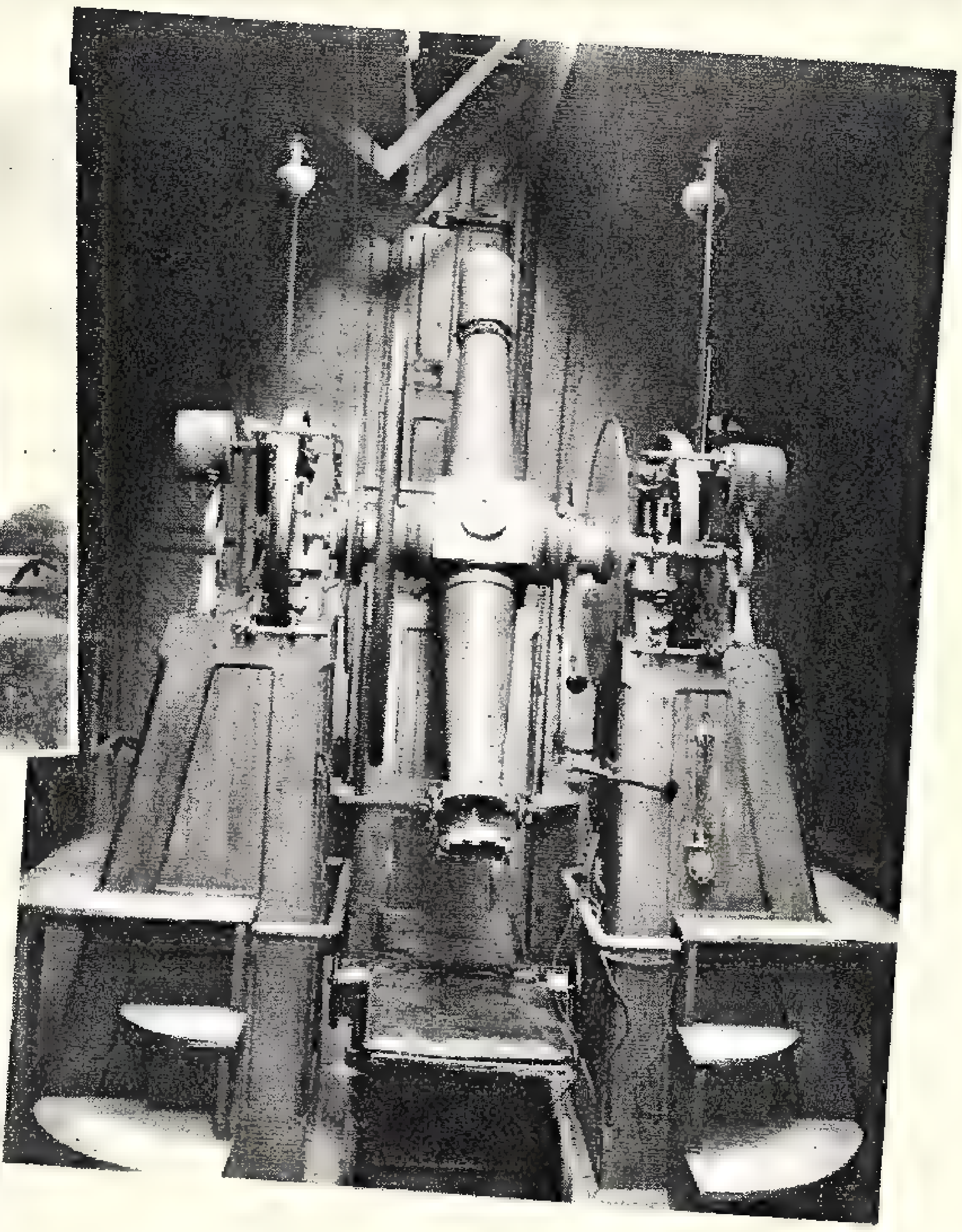
The new Ford, with its front like the rakish prow of a boat, and "tear drop" headlights set into streamlined fender aprons, makes it bow. The hood is hinged at the back, lifts from the front.

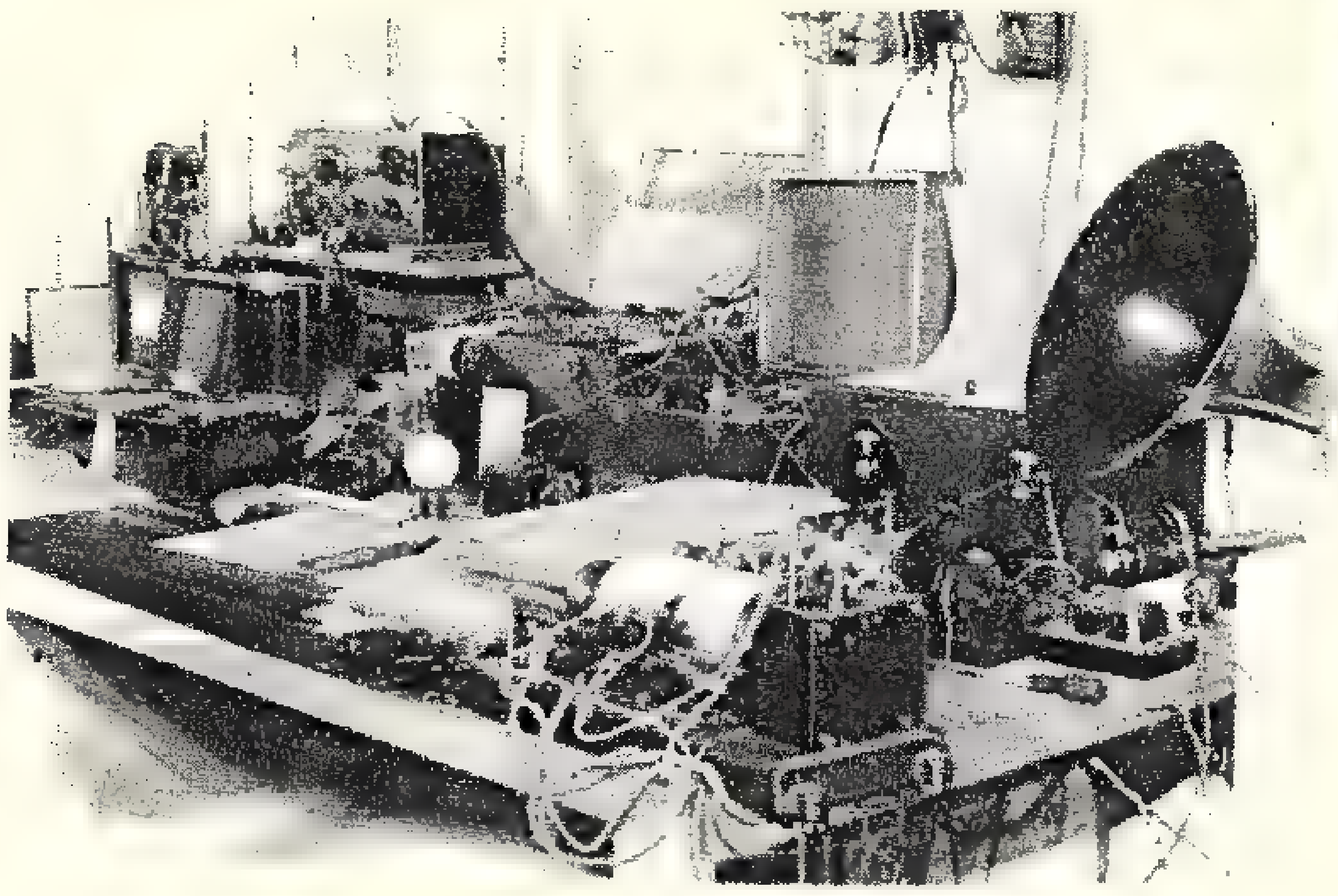


Britain is still going in for midget autos, and latest is the "Scoota-car Special," which has a top speed of 45 m. p. h. and can get 80 miles on a gallon.

ARE WE DRIFTING TO CHINA?

Ottawa Observatory, where continent's drift is studied.





Meridian circle transit instrument used in measuring possible shift of North America toward Asia. At left is shown a wireless receiving station at special observatory.

IF YOU live long enough you may yet reach China without taking train, steamer, plane or rocket. For both North and South America are suspected of drifting over that way and scientists are figuring how long it will take, and observers from many parts of the world have sent in their reports to Paris for comparison.

Preliminary figures over a seven year interval do not show us traveling westward, but, say scientists, the drift is so small the human error factor in the many observations may be just enough to counteract the drift. And so they still cling to the hope that the Americas are on a westward journey to join Asia.

In 1926 and again in 1933 stations were set up at Greenwich (England), Ottawa, Vancouver and Tokio in a northern chain, and at Algiers, Washington, San Diego and Shanghai in a middle zone. In addition, many other observatories throughout the world took part. In 1926 there were over 40 observatories at work on the theory and in 1933 about 100 took measurements.

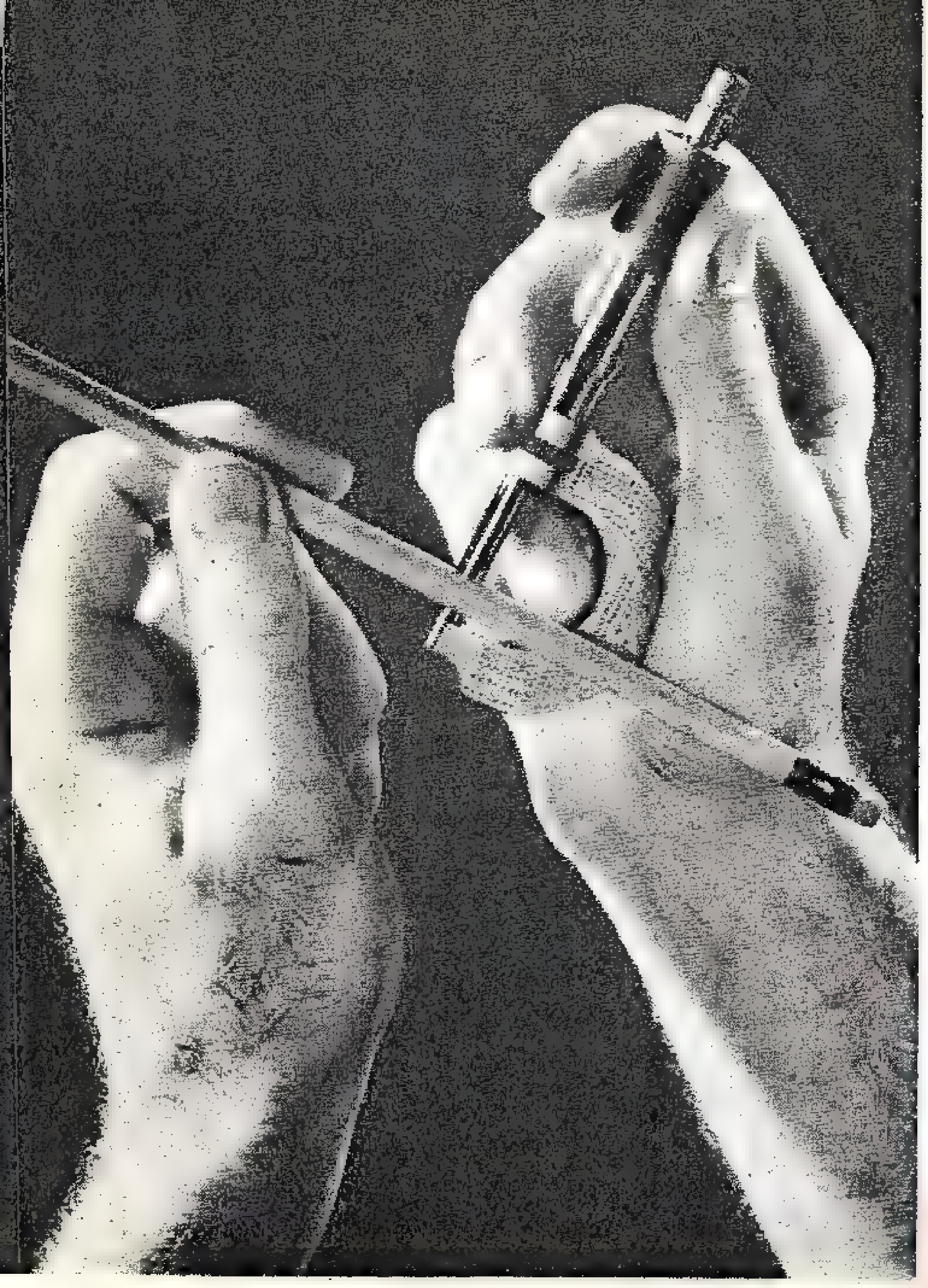
All these observations are being taken to prove or disprove the Wegener theory that North and South America once were joined to Europe and Africa Because of the interlocking jig-saw shape of the four continents, geologist Wegener advanced the theory that the four continents and Australia were once one land mass.

The observations, taken with a large assortment of instruments, wireless signals, and the help of the stars, covered between two and three months in 1926 and 1933. Each observatory completed a preliminary computation and then handed the whole thing over to the International Time Bureau at Paris, where the final results are being compiled.

According to the theory, the continental drift amounts to two or three feet per year. The amount is largely guess work, however. But on the assumption that the amount is right, it would take 50 years before the Americas moved 100 to 150 feet towards China. Which is not a large amount on a continent measuring 3,000 miles.

BEHIND THE

by Robert W. Gordon



Within the thickness of the pencil in the calipers, 20,000 thin razor edges can be stacked. Each edge is one-eighty-thousandth of an inch.

The oscillograph, an instrument that "sees" through steel, is used to detect hidden flaws.

TAKE a look at any group photograph of half a century ago. No matter what their station in life, the faces of the men you see there will be adorned with luxuriant crops of whiskers. Some were clipped plain, with the simple dignity of a cemetery hedge. Others were brushed and trimmed in weird and wonderful designs, like decorations on a wedding cake.

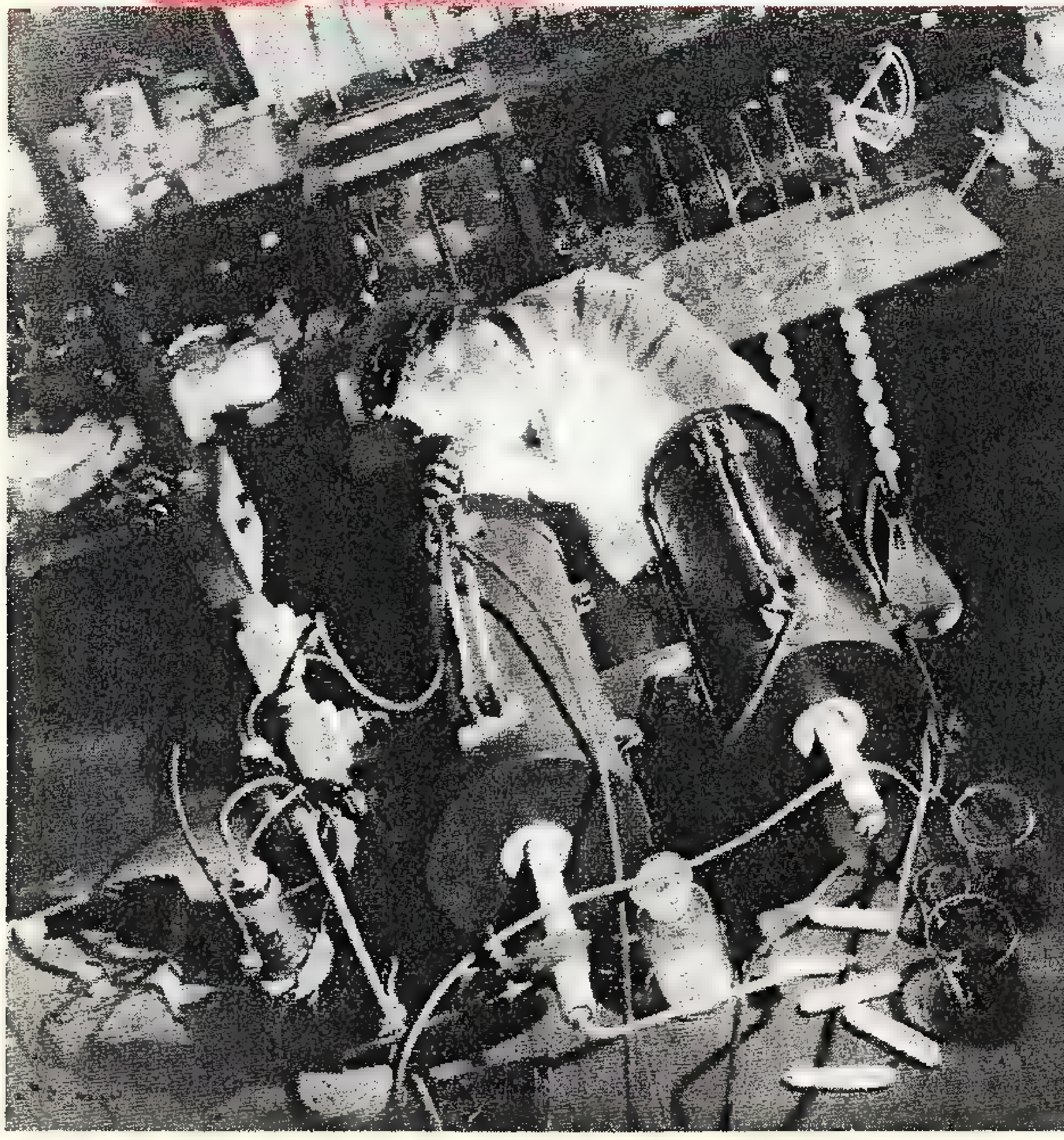
Now take a look along the street—any street in almost any country. You see a new race of men entirely. You can really see their faces, and they are bright and clean. No more of this hiding behind the bush. Their jaws are as bare of foliage as an oak tree in January.

Has science given us a new race of whiskerless males?

You know it has not. The whisker crop is as bountiful as ever, but it is harvested earlier—harvested every morning by the majority of men throughout the world.

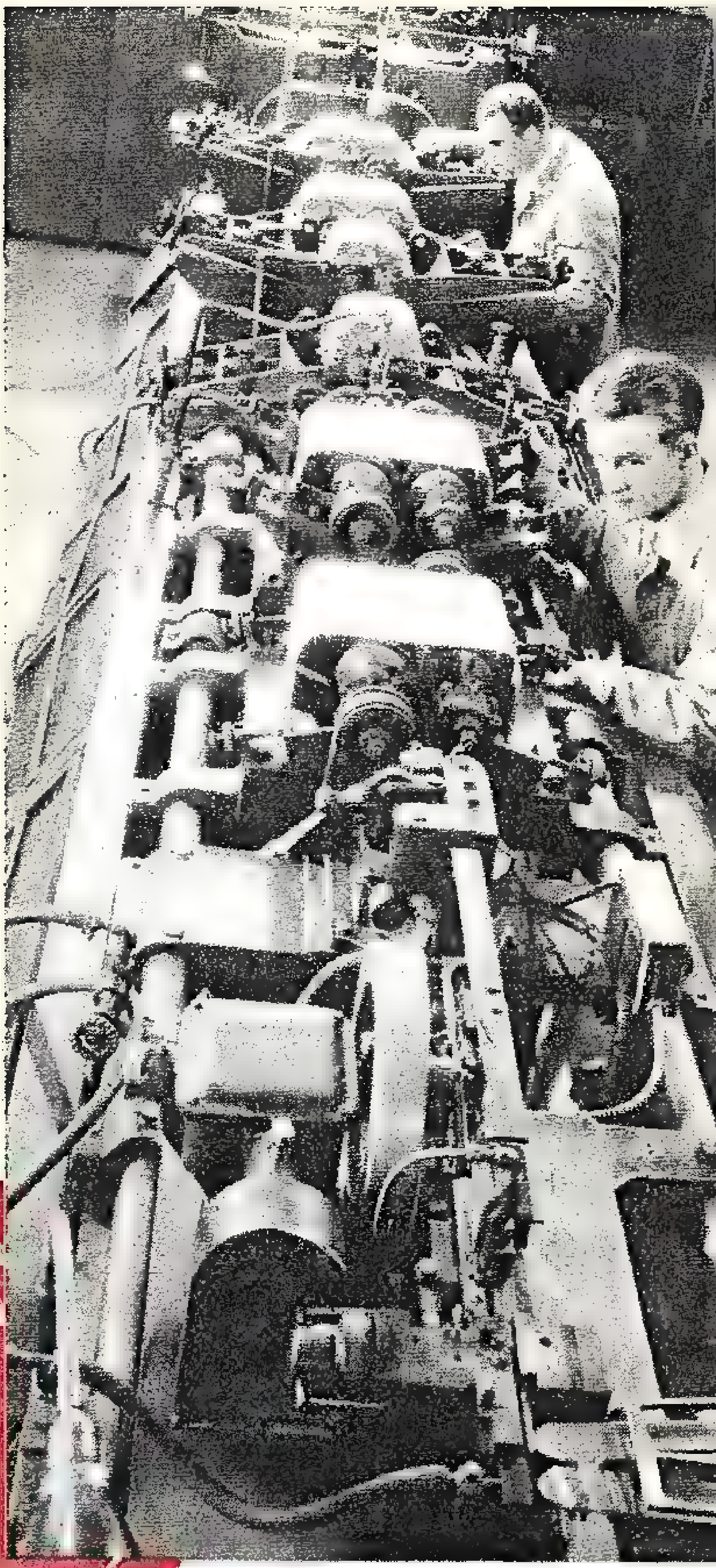
Now the only conclusion we can draw from this is that men never really liked whiskers any more than did the women. But down through the centuries, elimination of the beard remained an ordeal.

Then along came King C. Gillette in 1895 with the safety razor. Whiskers didn't disappear over night. Men were proud of the

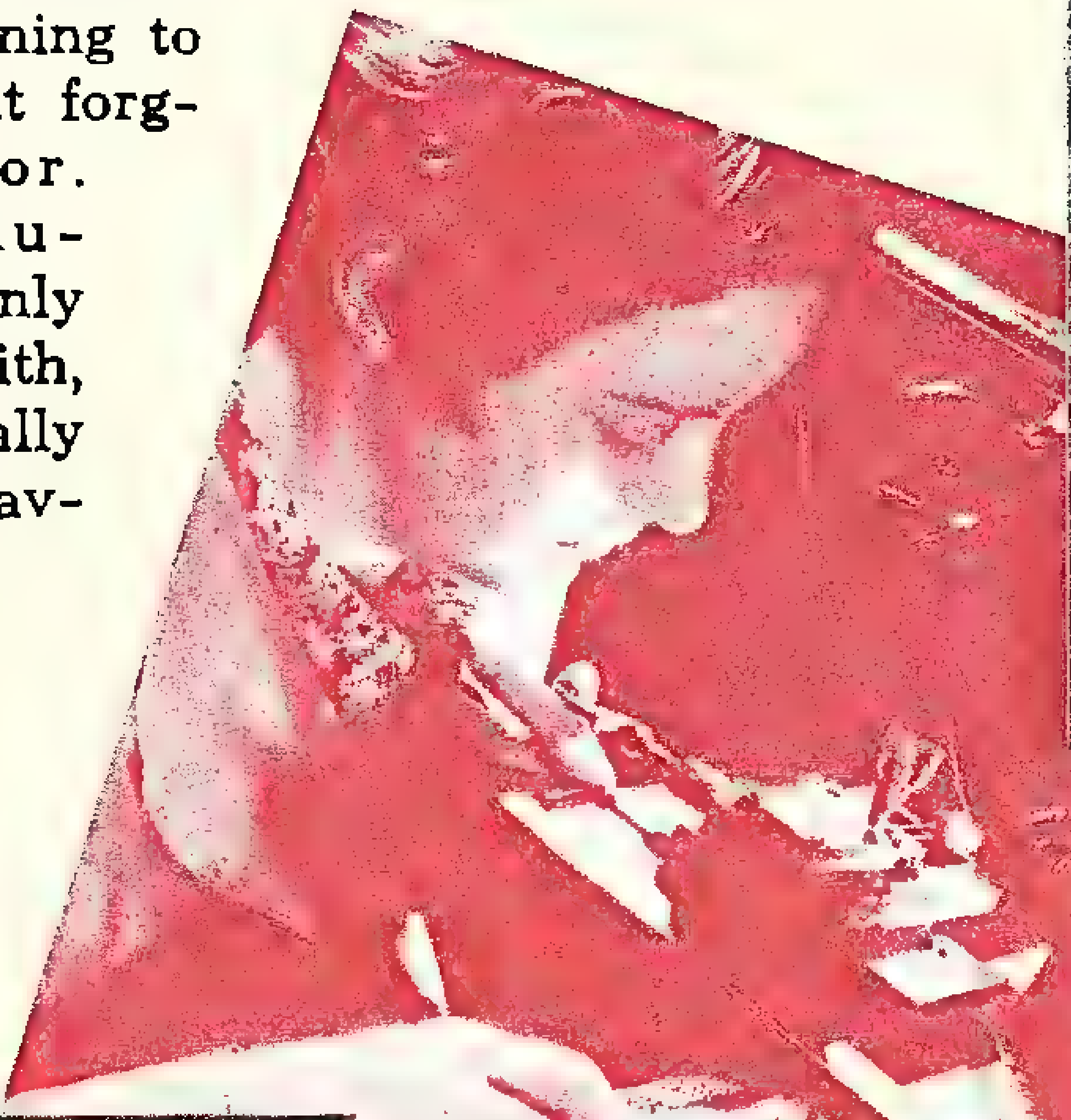


A sample goes into an electric furnace to be burned in a stream of oxygen. Vapors are analyzed to see that the proper proportion of carbon is present.

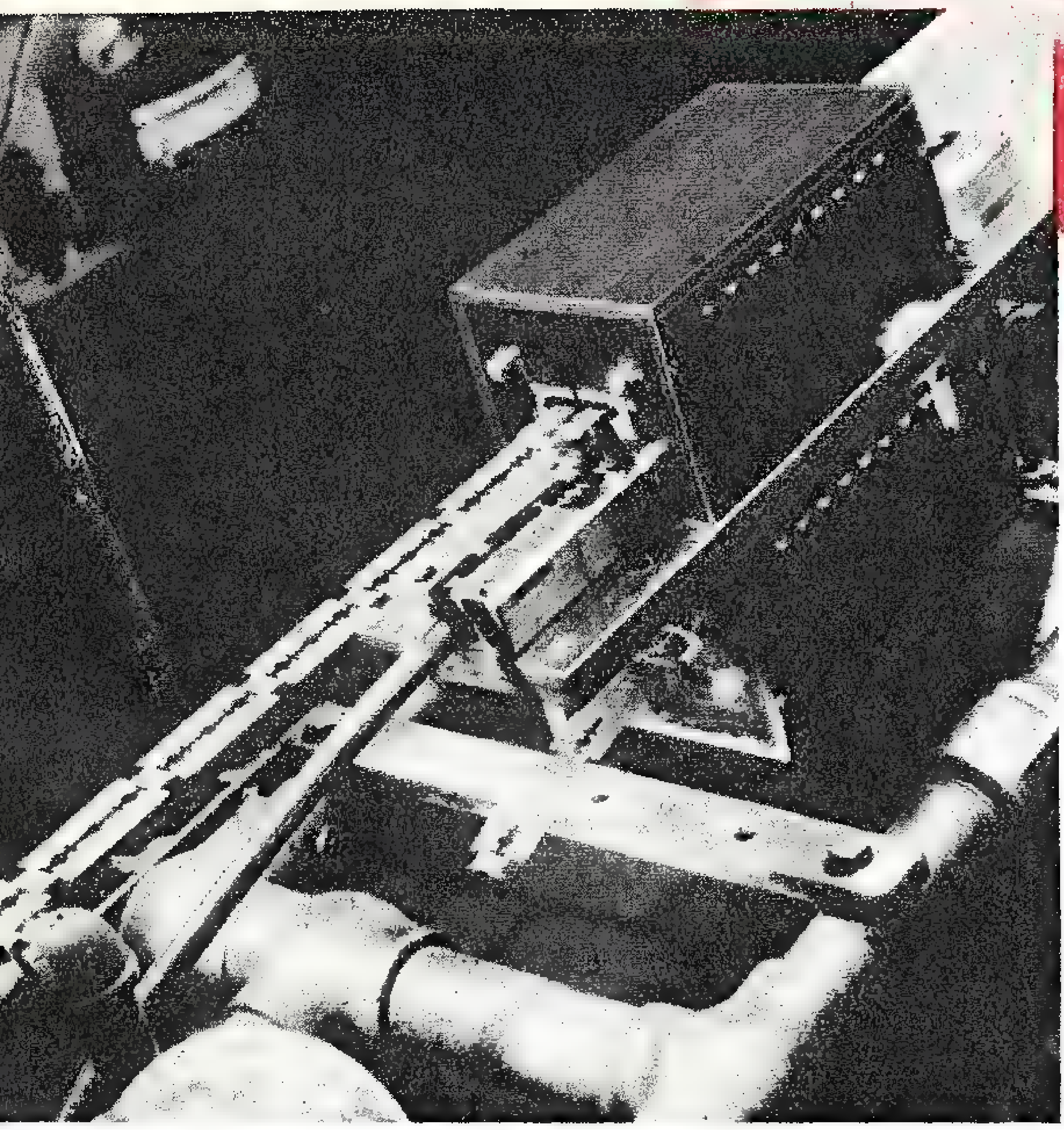
RAZOR BLADE



This machine performs one grinding, three honing and one stropping operation and cuts and stacks the blades on racks.



Samples of each coil are submitted to the diamond test for hardness. If it fails in the requirements, coil is rejected.



Variations in hardness are detected by this black box in the Gillette factory at Boston. If the steel in process above does not match the master strip below in hardness, the electricity going to furnace is varied.

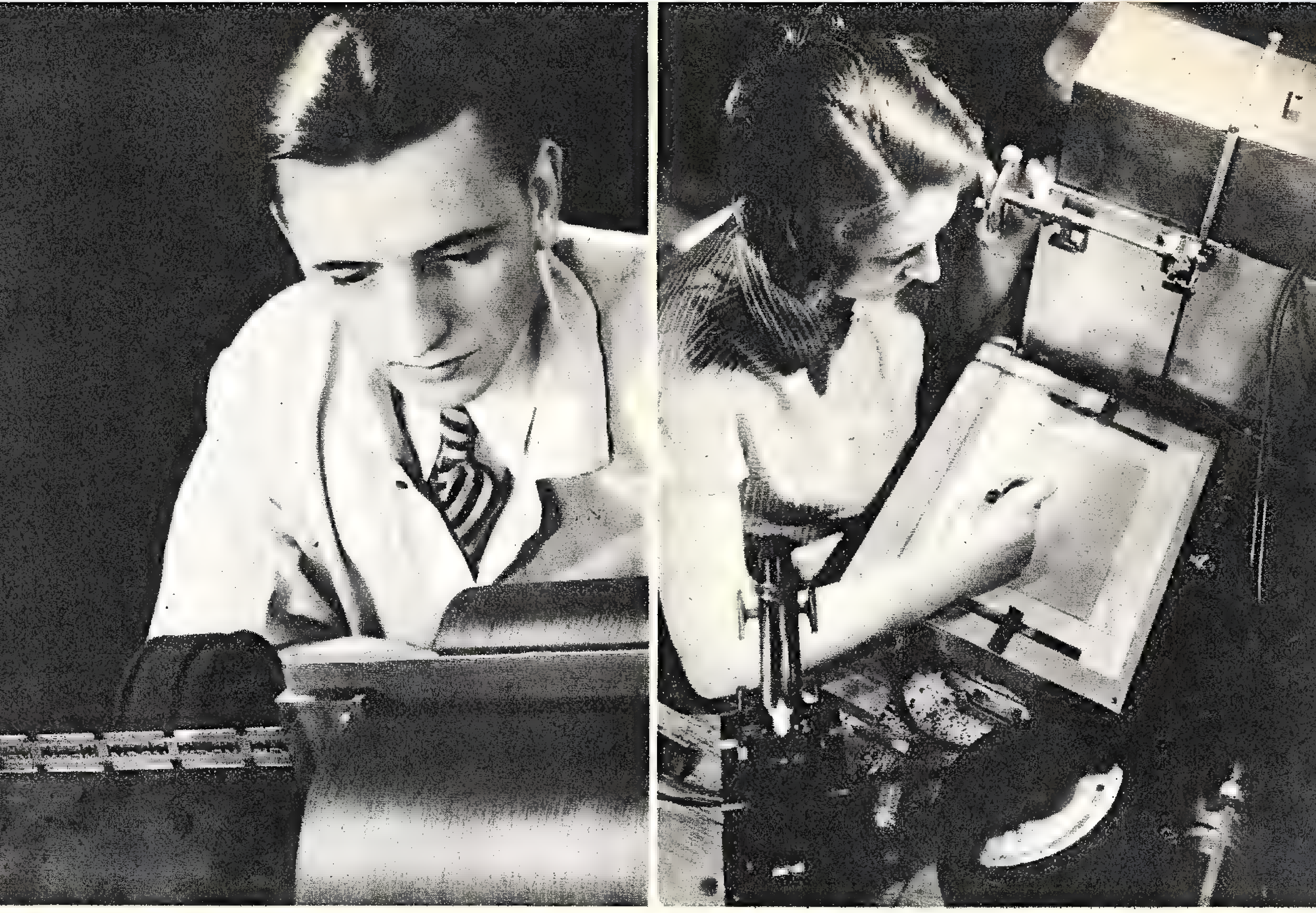
wiry toughness of their beards. You couldn't convince *them* that a little piece of metal stuck into a miniature double-edged hoe, could make shaving a painless, two-minute chore.

Even those few with faces too handsome to conceal, who went through the daily face-scraping with much the same martyr-to-looks spirit a woman assumes when getting a permanent, demanded a great steel forging, laboriously hollow ground, and equipped with a fancy handle. It required a lot of stropping and honing to keep a keen edge on that forging they called a razor.

Gillette had the revolutionary idea that it was only the edge you shaved with, and that the rest didn't really matter. He popularized shaving by developing an edge so sharp it is invisible, yet so cheap you can throw it away after using it once.

And the edge of the razor blade actually is invisible, even when looked at through the highest-powered microscope. The cutting edges of 80,000 blades, laid side by side, would occupy only one inch of space.

They demonstrate this absolute invisibility at the factory in Boston. They will show you a stack of blades a foot high, clamped together on a special holder. So accurately are the blades cut that the unsharpened ends appear as one solid bar of shining steel. Now turn the stack on edge. You see no shining metal there—only solid black. There is not enough metal on the cutting edges of that stack of blades to reflect a single beam of light. You can photograph it and get nothing on the plate but a solid black rectangle. Place a single blade on its side under a high-power microscope, and there will be no saw-tooth effect—only a straight line. Place the blade



Blades are pictured at left during the sharpening process. Two sets of grinding wheels, one for each edge, first remove the rough stock. The girl at the right is operating the photoelectric sharpness testing machine.

on edge and you will see nothing. One-eighty-thousandth of an inch is too infinitesimal a point in space to be seen by the eye, even when aided by the highest-powered microscope science has produced.

To obtain a cutting edge so sharp, close control and microscopically-fine limits of accuracy are required for every operation of manufacture.

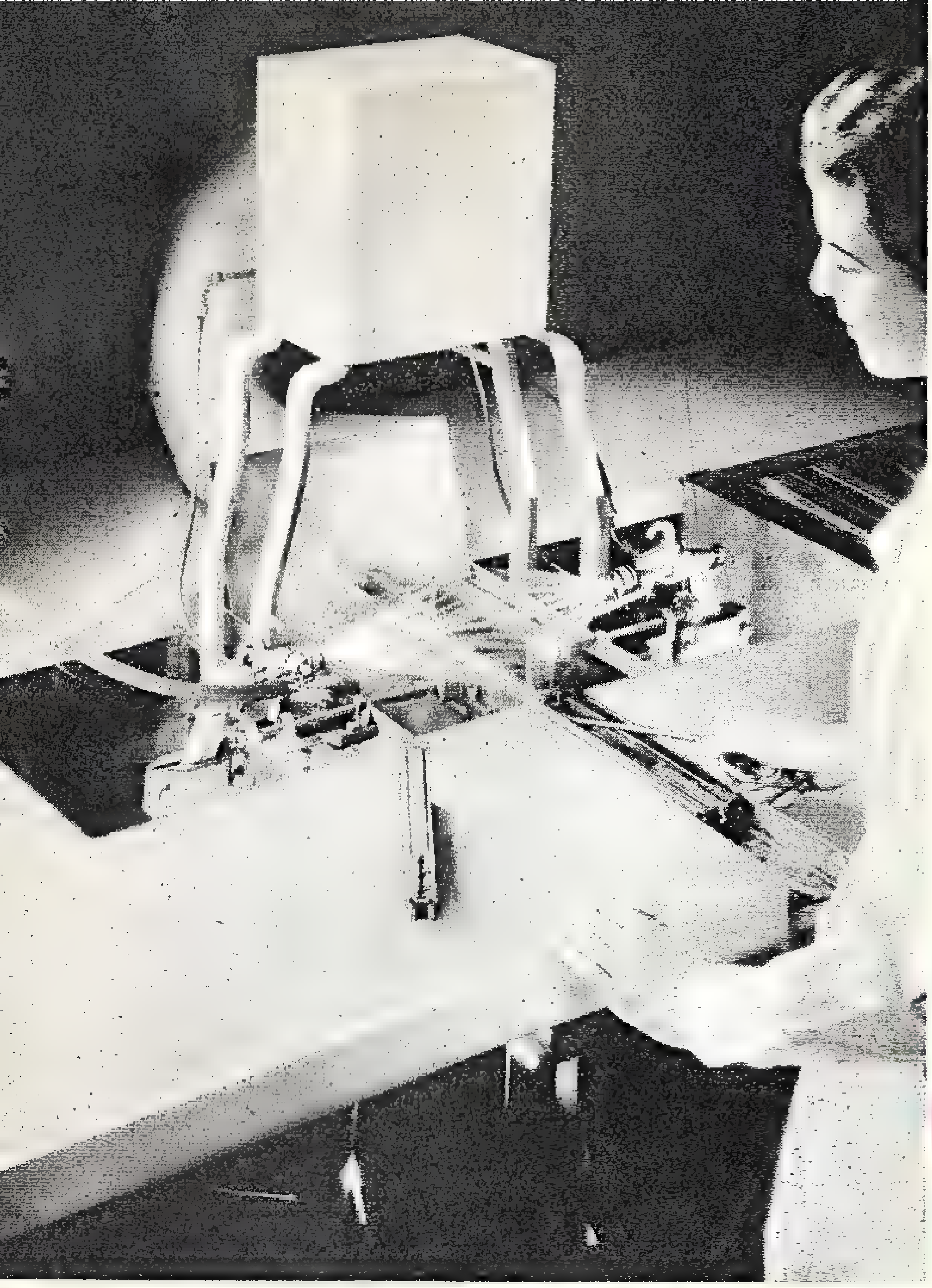
Swedish steel is used because of the high quality of Swedish raw materials and the long experience and great skill in rolling possessed by the Scandinavian mills. To insure uninterrupted production schedules with accompanying uniformity of quality, a tremendous steel inventory, representing an investment of several hundred thousand dollars, is carried in storage.

The coils of raw steel arrive from Sweden, each wrapped in heavy crepe paper, covered with oily waterproof paper, while the surfaces of the steel ribbons are coated with a special rust-proofing compound. Six coils are hermetically sealed in a tin container, which is protected by a wooden box. Thus protected, the shipping case could be immersed in sea water without damage to the contents.

As the cases are opened at the factory, a sample is cut from each end and tagged with the number of the coil. Another tag is placed on the coil itself, and follows the steel throughout the factory until the finished blades are packed. Each person who handles that particular coil, whether for manufacture or testing, must initial the tag. When the coil passes from one stage of manufacture to another, it is checked in and out of the control room. This intricate system of checking and rechecking makes it possible to detect flaws instantly and trace them to their source. It makes it possible to guarantee that only perfect blades will be offered for sale.

The original samples of the soft cold-rolled steel are submitted to a series of rigid laboratory tests to see that specifications for width, thickness, and metallurgical characteristics are fulfilled, and only when these tests are completed, and an O. K. placed on the tag, is the coil released for production.

Width and thickness are checked by micrometer gauges, and the variations permitted are infinitesimally small. A sample is then placed in the oscillograph, an instrument that virtually sees through steel. Hidden flaws, strains resulting from improper rolling, incorrect micro-structure, are instantly detected.



As a final step in the long process, finished blades are sprayed with a powerful antiseptic solution. They are then wrapped and sealed.

Samples of each coil are then sent to the laboratory and microphotographed at 3,000 diameters. A trained metallurgist studies these photographs to determine if the inner structure, the combination of elements making up the metal, is suitable for blades.

Another sample goes into an electric furnace, to be burned in a stream of oxygen. Vapors resulting from this combustion are analyzed chemically to see that exactly the right proportion of carbon is present.

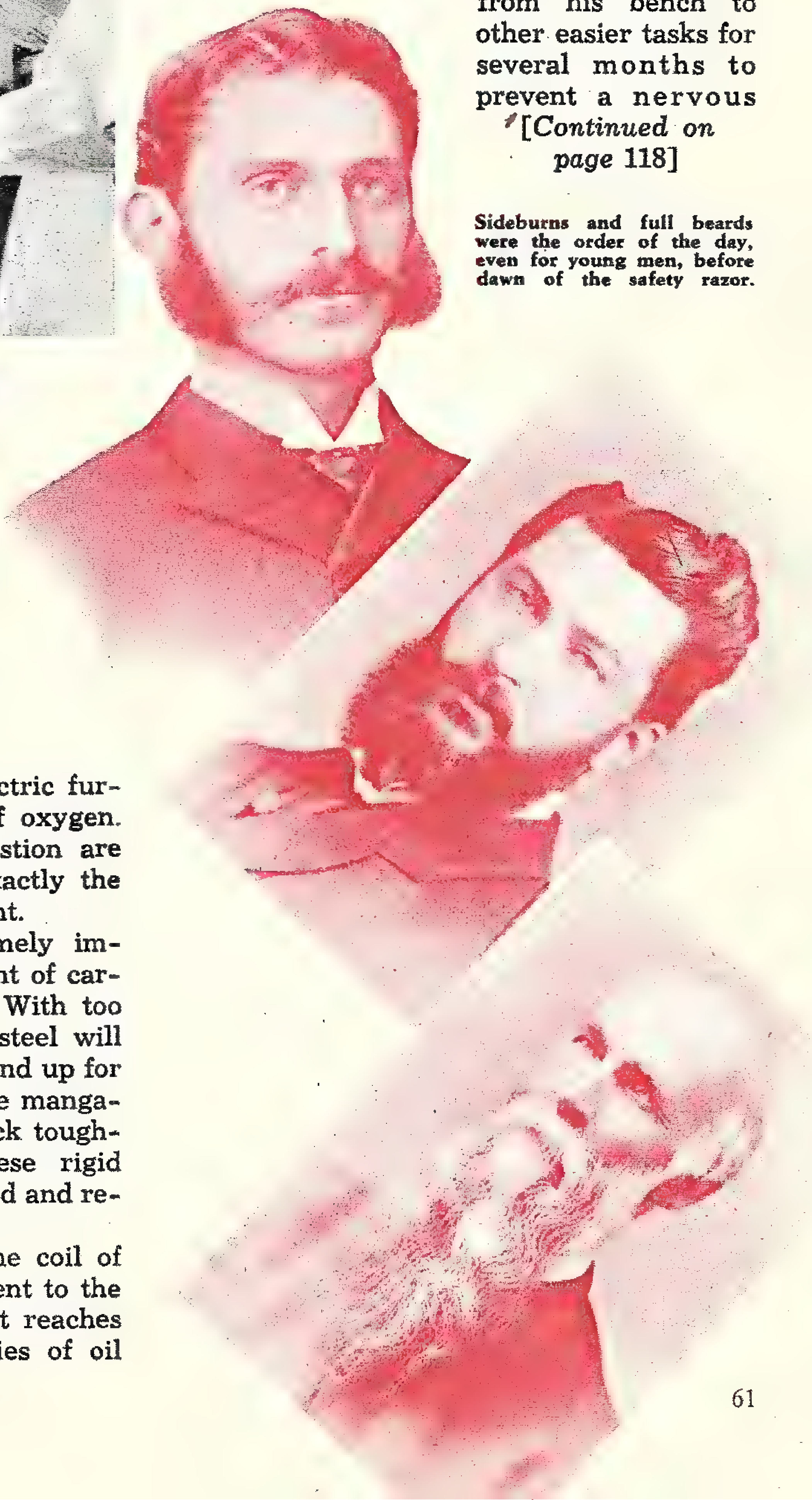
This chemical content is extremely important. Without the proper amount of carbon the steel will lack hardness. With too much sulphur or phosphorus, the steel will not yield a cutting edge that will stand up for a number of shaves. With too little manganese or chromium, the steel will lack toughness. Metal failing to meet these rigid laboratory tests is immediately crated and returned to Sweden.

If approved in the laboratory, the coil of soft steel is wound on a reel and sent to the perforating machine. But before it reaches the dies it feeds through two series of oil wipers, which remove any foreign matter adhering to the strip and add an oil which aids the perforating die and prevents rust between this and the next operation.

These dies that punch out the center slot are the acme of accuracy. They must be if the blade is to be held in the razor at the correct position for a proper shave. Unable to obtain such accuracy elsewhere, the factory employs its own corps of die cutters, any one of whom could grind the print off this page without removing a particle of the paper.

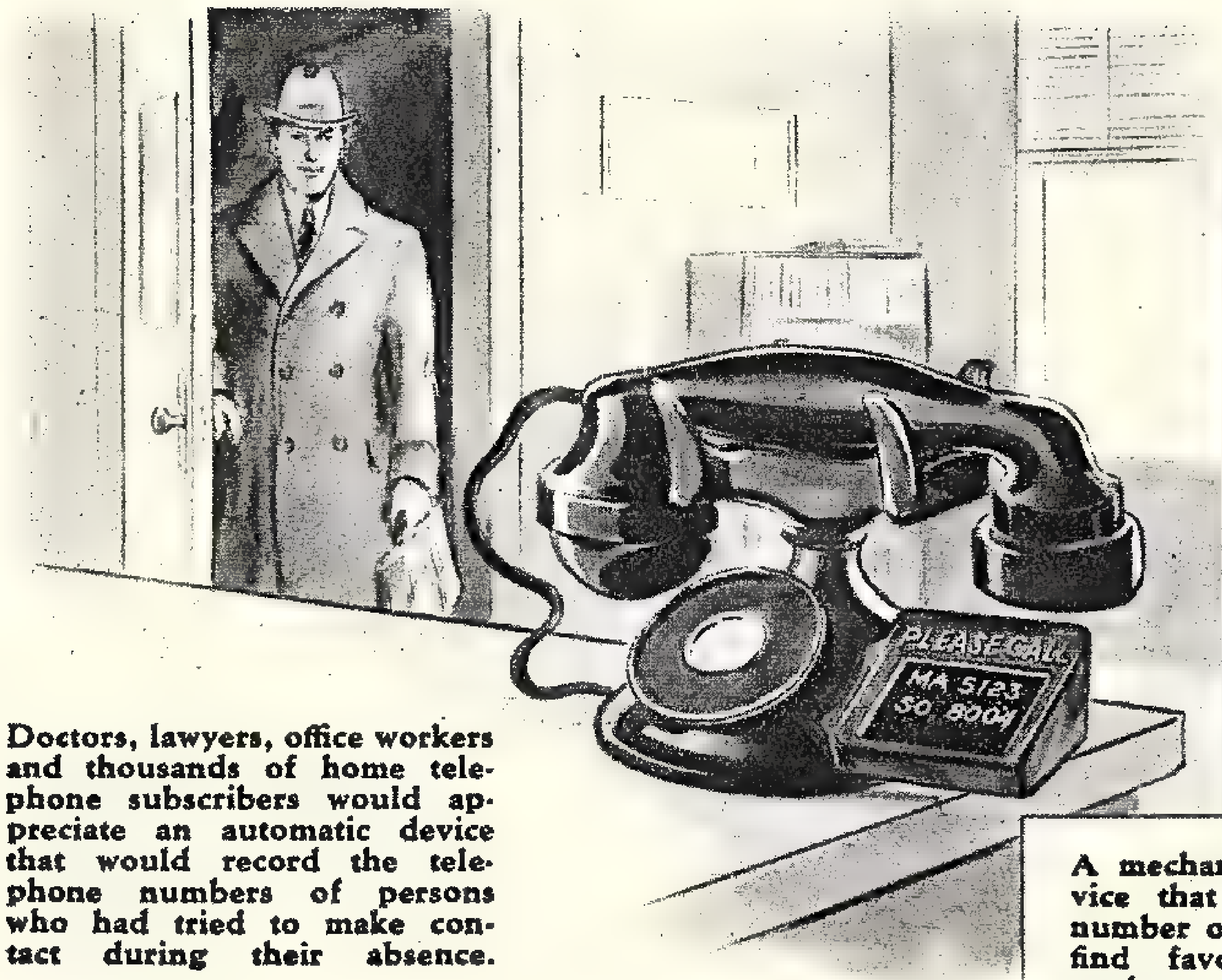
So critical is the workmanship demanded here that in certain cases it has been necessary to release a man from his bench to other easier tasks for several months to prevent a nervous

[*Continued on page* 118]

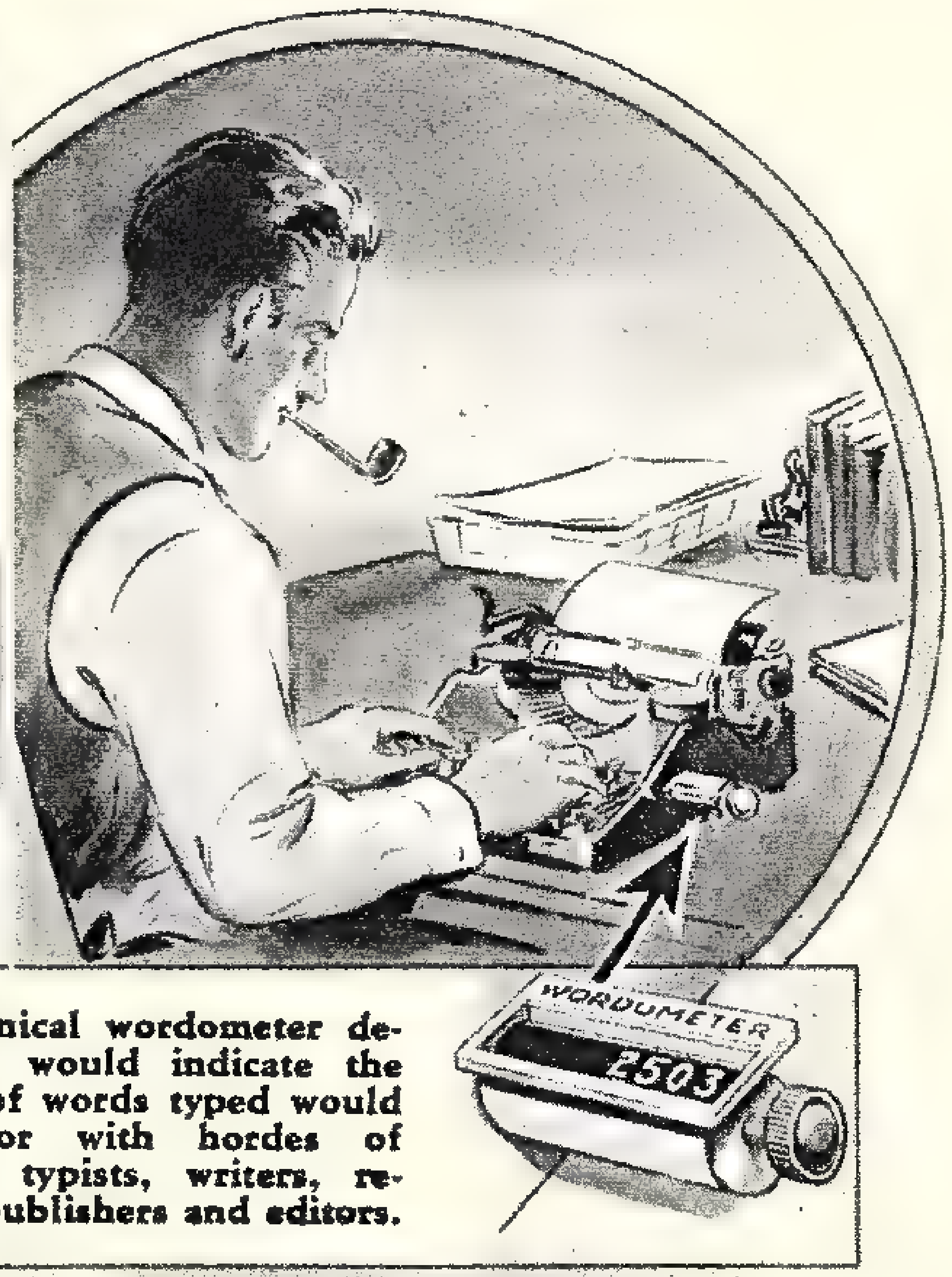


Sideburns and full beards were the order of the day, even for young men, before dawn of the safety razor.

Women Head Winner's List in M. M. Inventions Contest



Doctors, lawyers, office workers and thousands of home telephone subscribers would appreciate an automatic device that would record the telephone numbers of persons who had tried to make contact during their absence.



A mechanical wordometer device that would indicate the number of words typed would find favor with hordes of students, typists, writers, reporters, publishers and editors.

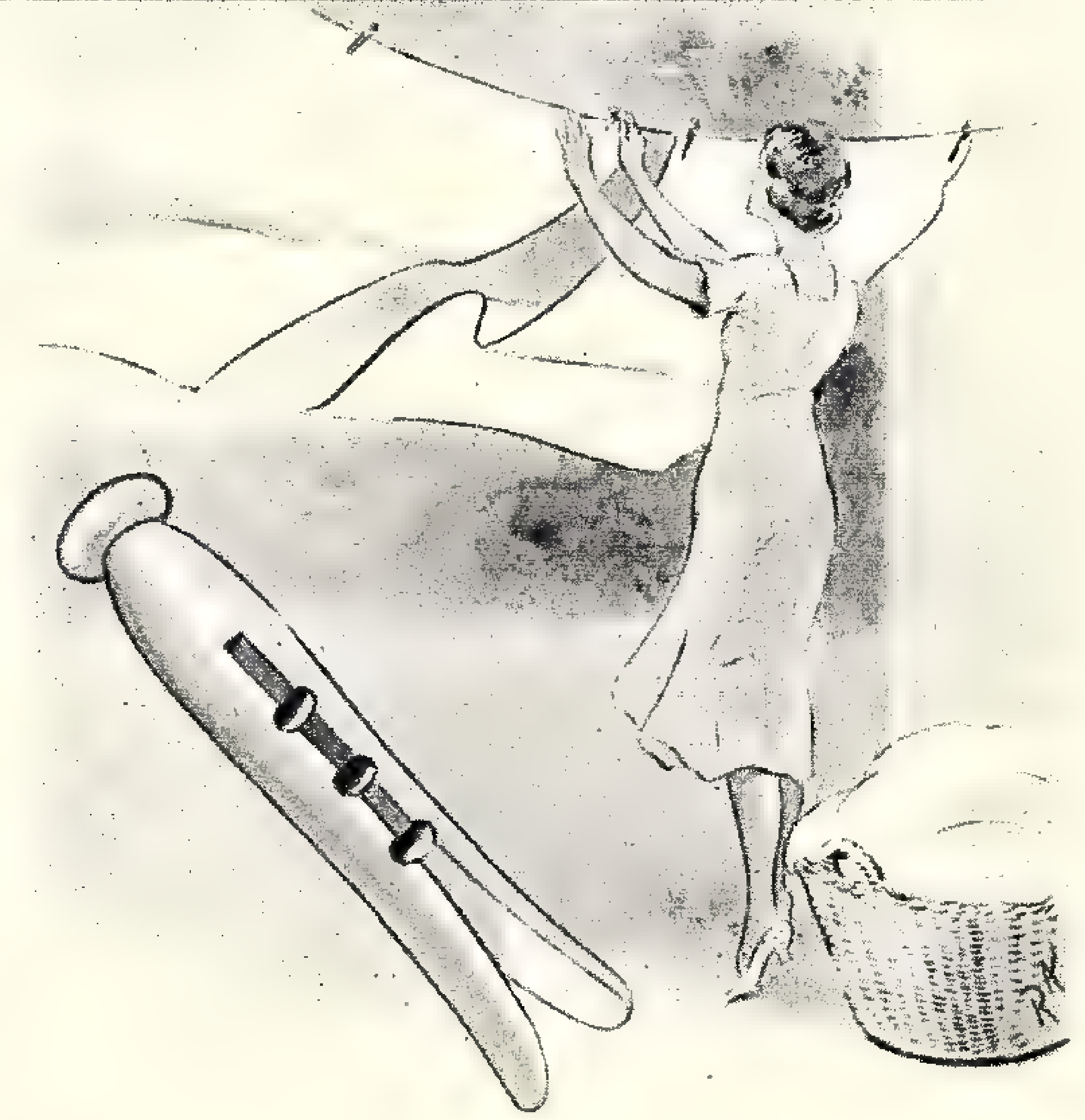
WOMEN head the list of winners of the MM Needed Inventions Contest this month. Miss Nan Conklin, of 8527 Thirtieth Street, N. W., Seattle, Wash., was awarded first prize of $25 cash for suggesting an automatic telephone device that would record the telephone numbers of incoming calls in the event the calls go unanswered due to no one being at hand to receive them.

PRIZES

First Prize	$25.00 in Cash
Second Prize	10.00 in Cash
Third Prize	5.00 in Cash
Three Fourth Prizes	2.00 each
Four Fifth Prizes	1.00 each
Total—10 Prizes	50.00 in Cash

Increased satisfaction on the part of telephone subscribers would result from the development of such a device. Upon arriving at home or office, one would immediately know if someone had been trying to make telephone contact, and a glance at the indicator board would show the number to be called.

Mrs. Ada Gearhard, of 1509 Division Street, Boise, Idaho, won second prize of $10 with a suggestion for a wordometer. The wordometer, a mechanical typewriter attachment, would indicate the number of words typed. Thousands of typists, writers and reporters would welcome the wordometer since it would eliminate the task of counting each word after typing out a page of copy.



Ordinary straight clothespins sometimes lose their grip when wind tugs at the heavily laden clothes line. A notched clothespin should overcome this annoyance to housewives.

A suggestion for a simple clothespin, designed to prevent working loose while being

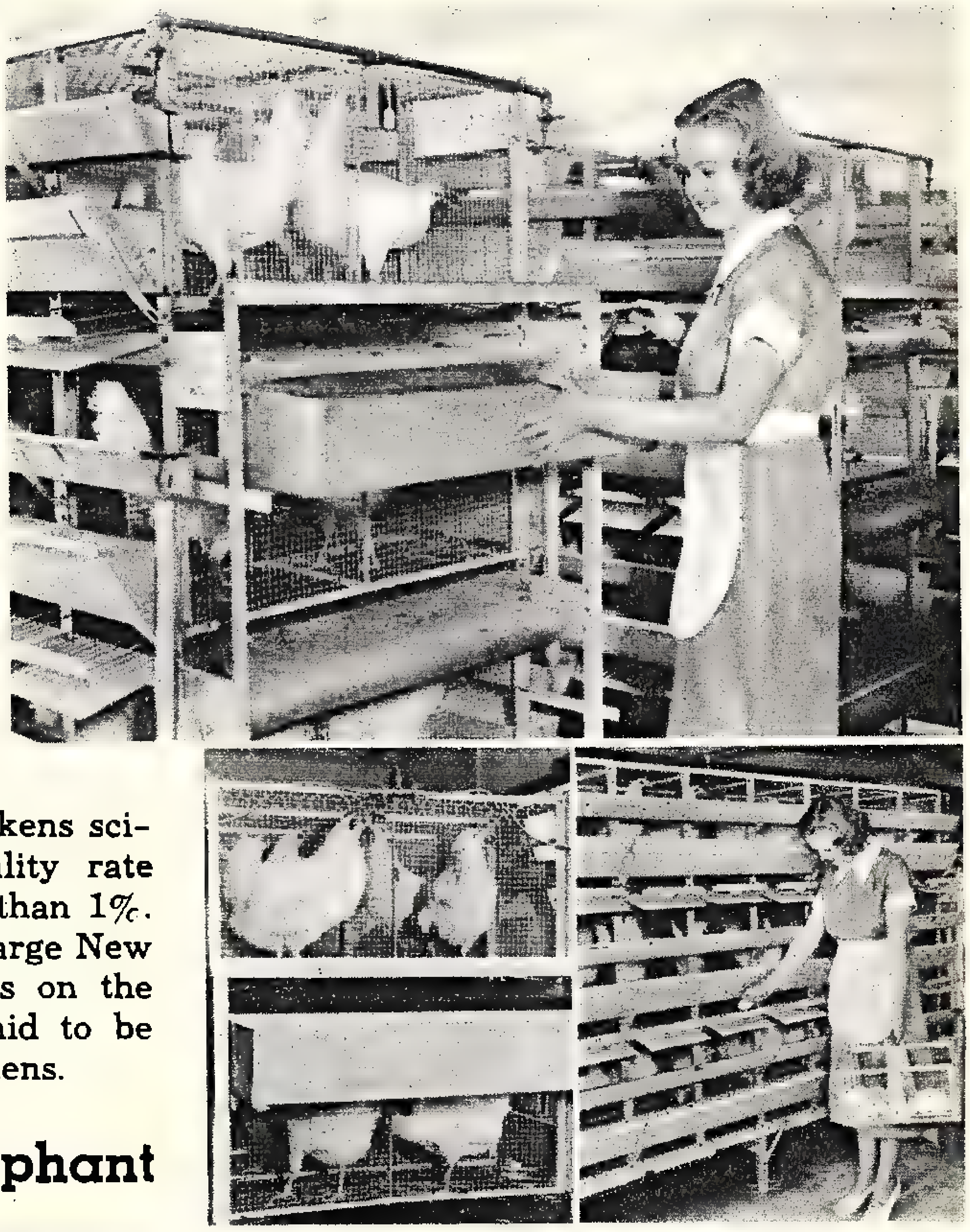
[*Continued on page* 125]

Lone Girl Raises 15,000 Chickens In Indoor Cages

ADOPTING a system invented by Milton H. Arndt, of Trenton, N. J., a 19 year-old Long Island girl, Lillian Swenson, is raising and taking care of 15,000 chickens indoors. The chickens never see or need the sunlight for the necessary vitamin "D" is supplied in their food.

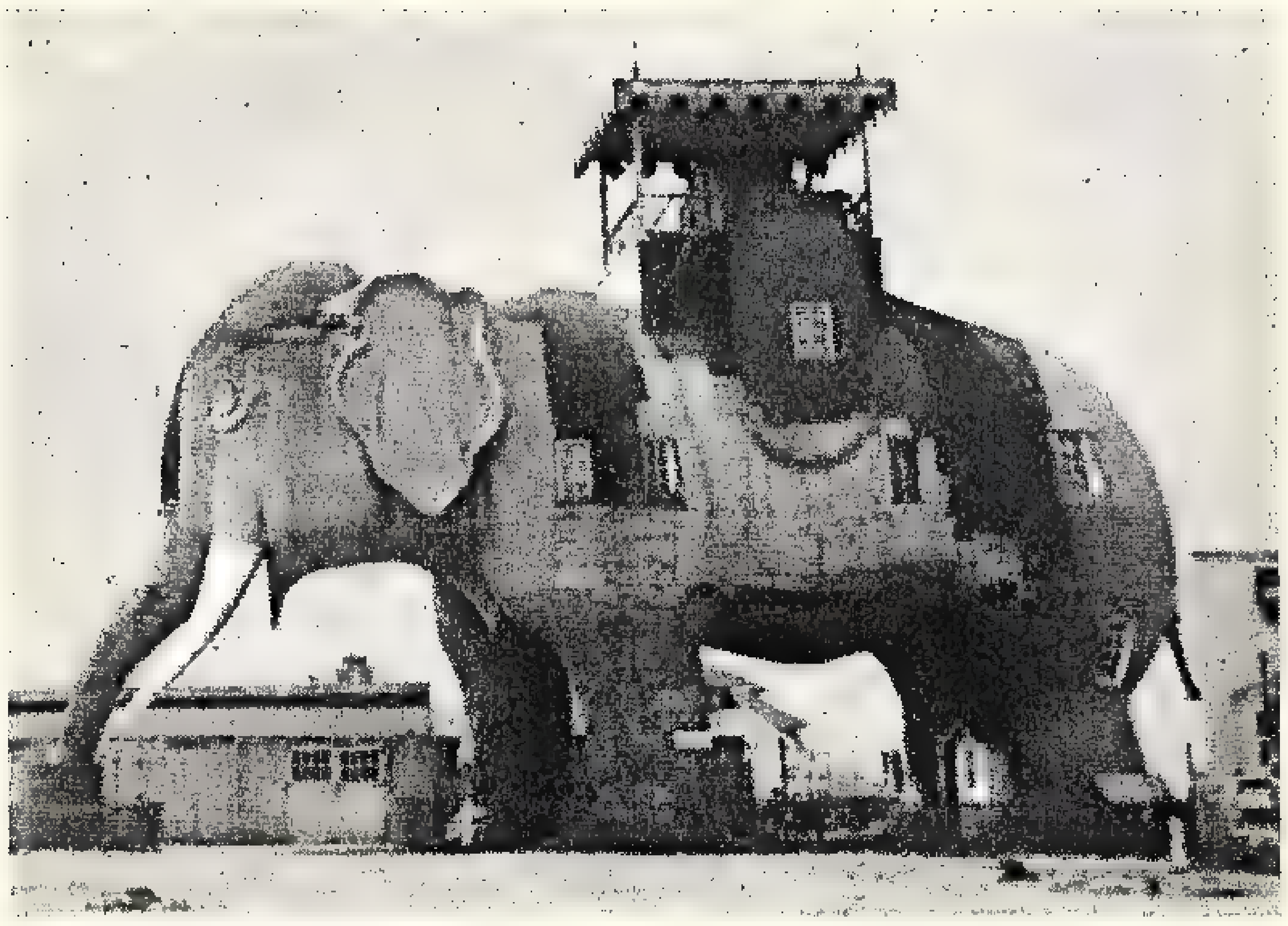
Each chicken has its own wire compartment measuring about one and a half feet square. Compartments are arranged in batteries of 100 chickens each making it possible to house them in a small area. Running water and individual feed troughs are located in each compartment.

Through the use of the indoor compartment system, using cellars, lofts, etc., and feeding the chickens scientifically balanced rations, mortality rate has been cut from 40-60% to less than 1%. So successful is this method that a large New York hotel raises its own chickens on the roof. The flavor of the eggs is said to be superior to those of barnyard chickens.



Top—Lillian Swenson shows how she cleans the cages in a few minutes by turning a crank that moves floor conveyor belt. Bottom right—Collecting eggs that have rolled against rubber guard. Charts are kept of each chicken. Left—Cage close-up.

House Shaped Like Elephant

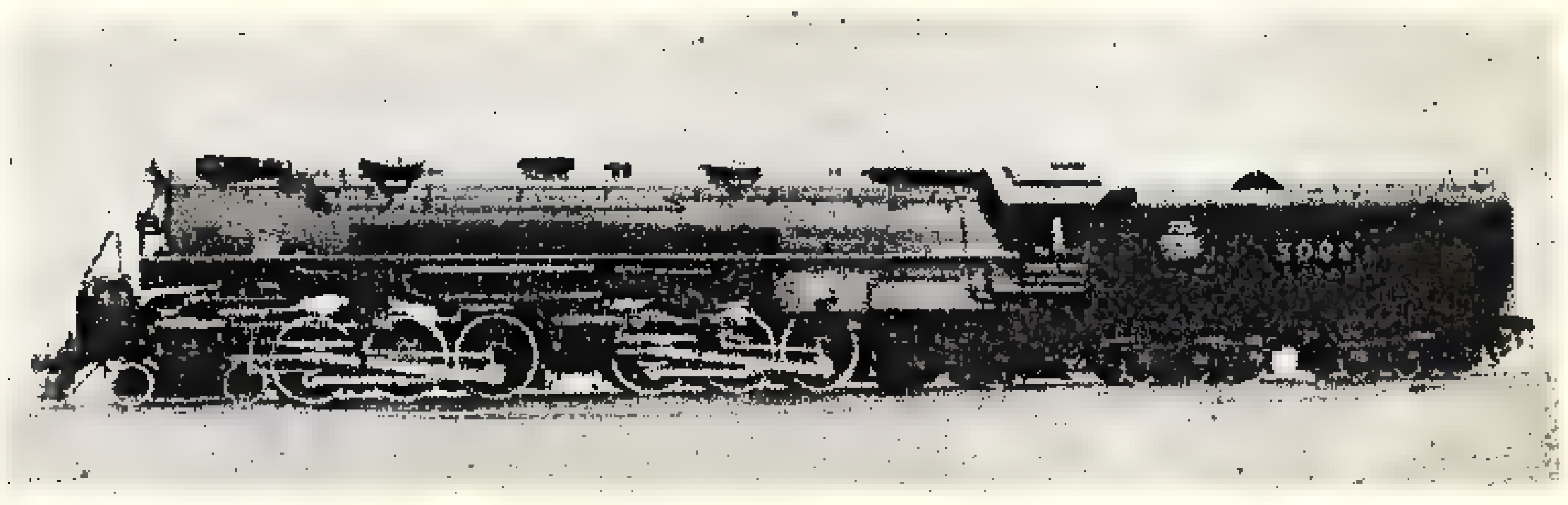


This elephant-shaped house at Margate City, N. J., has 22 windows. It consists of over a million pieces of wood, 8560 ribs, 200 kegs of nails, 12,000 square feet of tin, four tons of bolts.

A HOUSE built in the shape of an elephant is located at Margate City, N. J. Erected in 1882 by James V. Lafferty, the novel home is said to be the only one of its kind. The body is 38 feet long, the circumference, 80 feet. The head is 26 feet long and 48 feet around. Legs are 22 feet long with a diameter of 10 feet. Glass eyes have an 18-inch diameter.

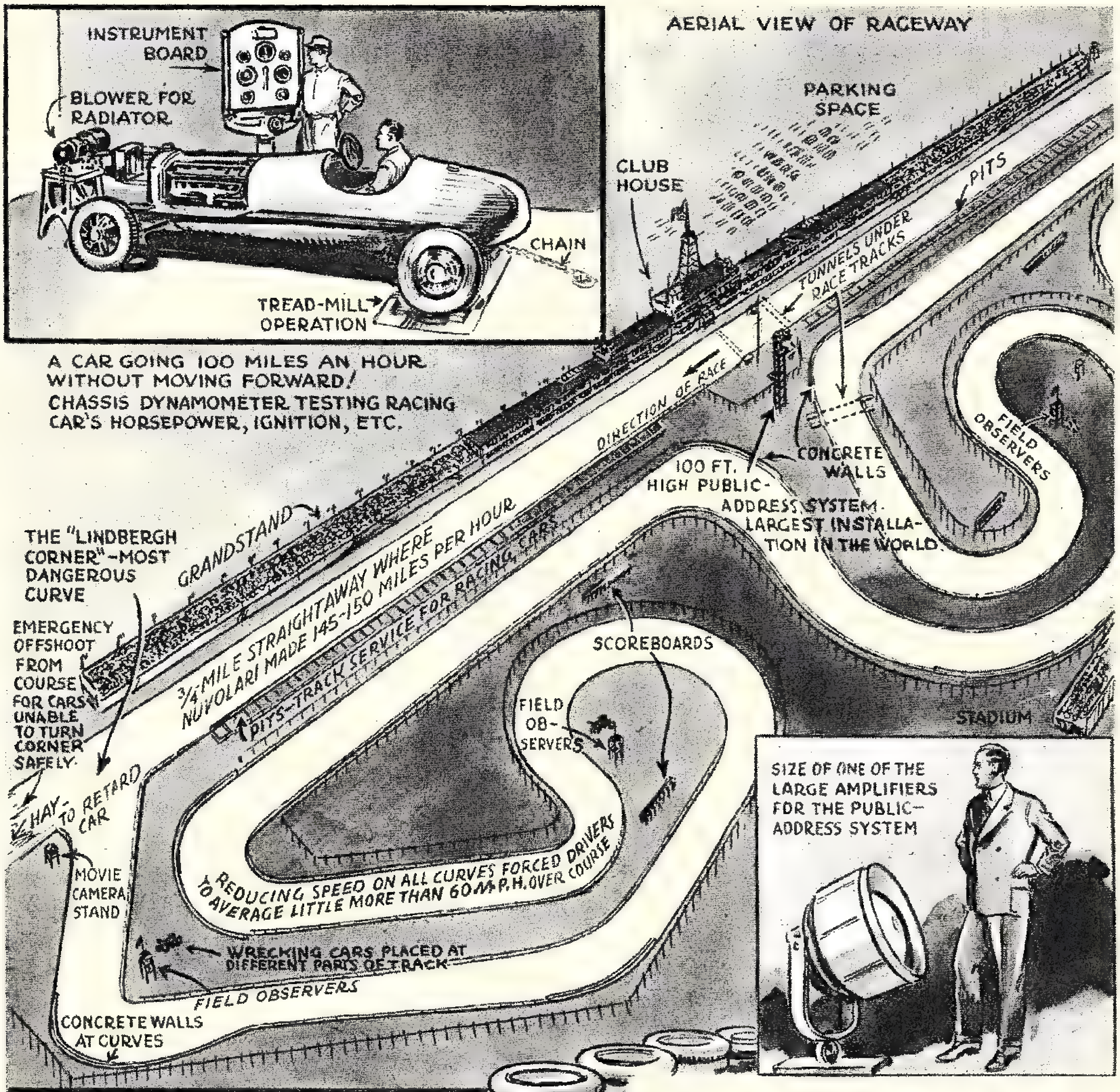
Locomotive Pulls 100 Cars

WITH an over-all length of 110 feet, a new Challenger type locomotive of the Union Pacific Railroad is powerful enough to pull a freight train of 100 loaded cars at a speed of a mile per minute. The locomotive weighs 432½ tons empty. The firebox of the engine is so large, 9x12 feet, that a mechanical coal stoker is needed. Tender carries 22 tons of coal, 19,000 gallons of water.



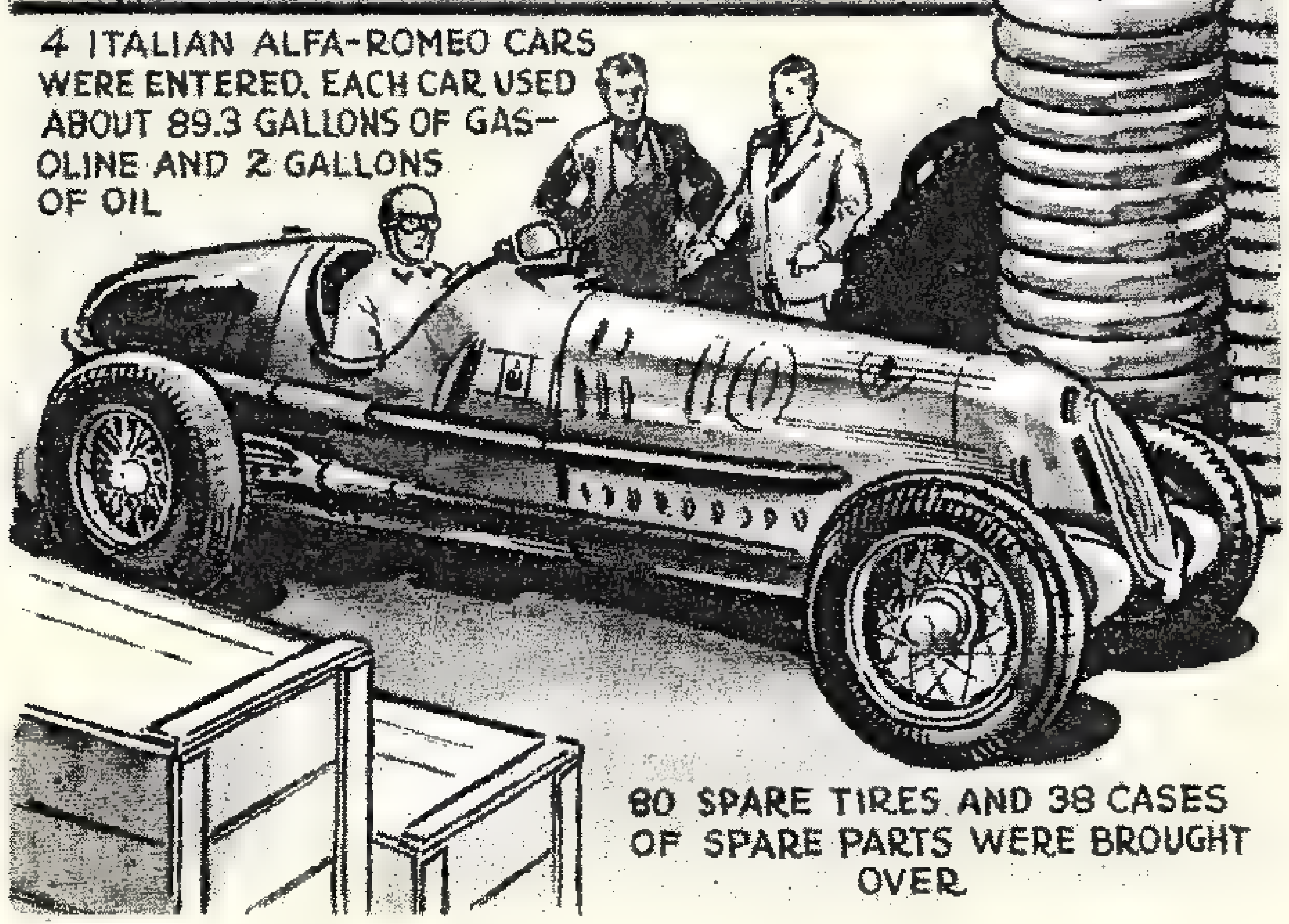
The American Locomotive Co., of Schenectady, N. Y., built this 110-foot engine for the Union Pacific Railroad. It will haul 100 cars. Drive wheels are 5 ft., 9 inches in diameter.

AMERICA'S NEWEST


AERIAL VIEW OF RACEWAY
INSTRUMENT BOARD
BLOWER FOR RADIATOR
CHAIN
TREAD-MILL OPERATION
PARKING SPACE
CLUB HOUSE
PITS
TUNNELS UNDER RACE TRACKS
DIRECTION OF RACE
CONCRETE WALLS
100 FT. HIGH PUBLIC-ADDRESS SYSTEM. LARGEST INSTALLATION IN THE WORLD.
FIELD OBSERVERS
GRANDSTAND
THE "LINDBERGH CORNER"-MOST DANGEROUS CURVE
EMERGENCY OFFSHOOT FROM COURSE FOR CARS UNABLE TO TURN CORNER SAFELY.
HAY-TO RETARD CAR
3/4-MILE STRAIGHTAWAY WHERE NUVOLARI MADE 145-150 MILES PER HOUR
PITS-TRACK SERVICE FOR RACING CARS
SCOREBOARDS
FIELD OB-SERVERS
STADIUM
REDUCING SPEED ON ALL CURVES FORCED DRIVERS TO AVERAGE LITTLE MORE THAN 60 M.P.H. OVER COURSE
MOVIE CAMERA STAND
WRECKING CARS PLACED AT DIFFERENT PARTS OF TRACK
FIELD OBSERVERS
CONCRETE WALLS AT CURVES

A CAR GOING 100 MILES AN HOUR WITHOUT MOVING FORWARD! CHASSIS DYNAMOMETER TESTING RACING CAR'S HORSEPOWER, IGNITION, ETC.

SIZE OF ONE OF THE LARGE AMPLIFIERS FOR THE PUBLIC-ADDRESS SYSTEM



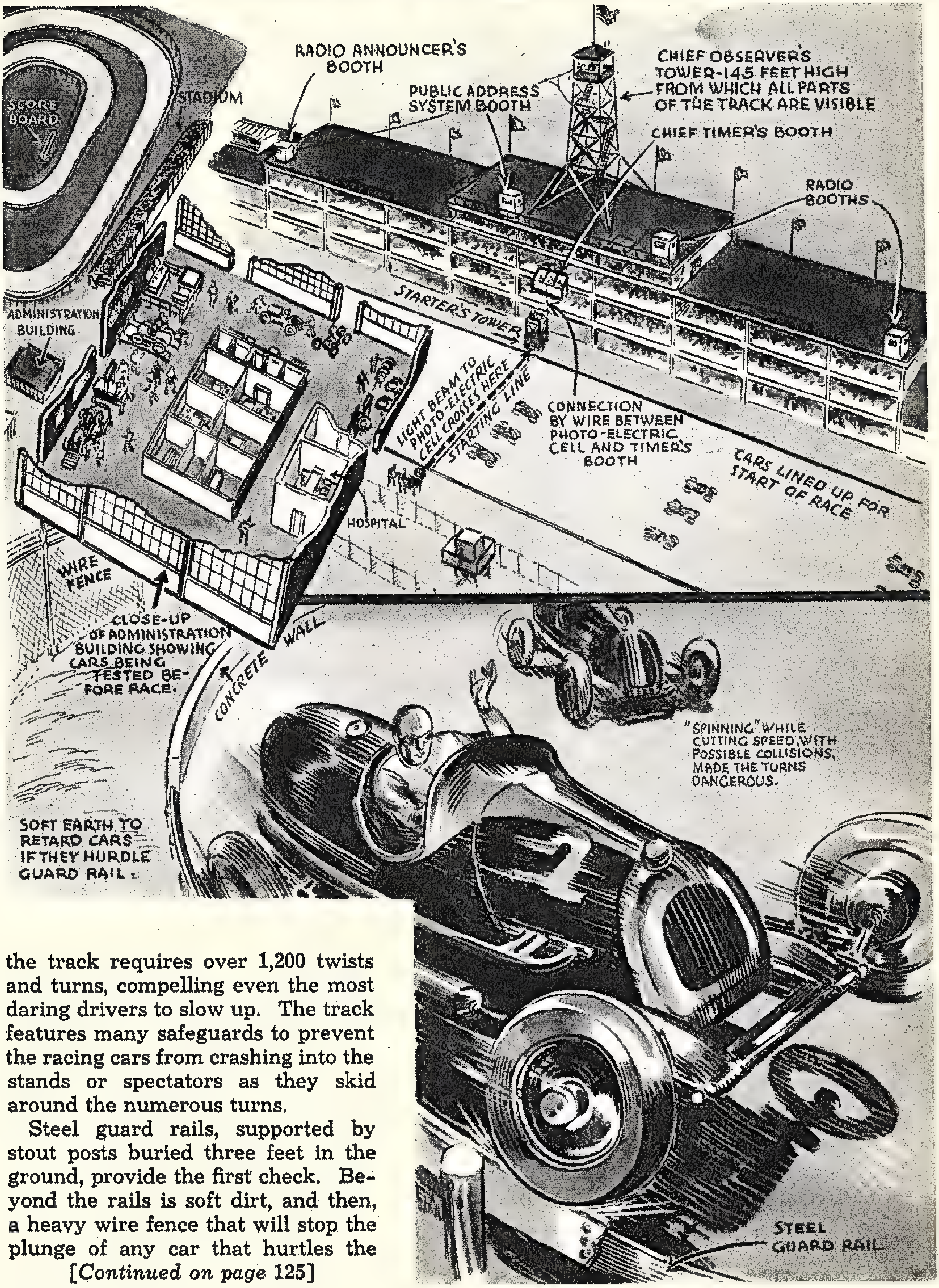
4 ITALIAN ALFA-ROMEO CARS WERE ENTERED. EACH CAR USED ABOUT 89.3 GALLONS OF GASOLINE AND 2 GALLONS OF OIL

80 SPARE TIRES AND 38 CASES OF SPARE PARTS WERE BROUGHT OVER

ROOSEVELT RACEWAY, located at Westbury, L. I., is America's newest and most dangerous automobile race track. So dangerous is the four-mile track with its twists and turns that Tazio Nuvolari, of Italy, who won the Vanderbilt Cup and $24,000 of the $60,000 prize money at the opening race last Columbus Day, averaged only 65.998 m.p.h. in his Alfa-Romeo racer although he attained speeds of 145-150 m.p.h. on the straightaways.

The average 75-mile race staged at

AUTO RACE TRACK


SCORE BOARD
STADIUM
RADIO ANNOUNCER'S BOOTH
PUBLIC ADDRESS SYSTEM BOOTH
CHIEF OBSERVER'S TOWER-145 FEET HIGH FROM WHICH ALL PARTS OF THE TRACK ARE VISIBLE
CHIEF TIMER'S BOOTH
RADIO BOOTHS
ADMINISTRATION BUILDING
STARTER'S TOWER
LIGHT BEAM TO PHOTO-ELECTRIC CELL CROSSES HERE
STARTING LINE
CONNECTION BY WIRE BETWEEN PHOTO-ELECTRIC CELL AND TIMER'S BOOTH
CARS LINED UP FOR START OF RACE
HOSPITAL
WIRE FENCE
CLOSE-UP OF ADMINISTRATION BUILDING SHOWING CARS BEING TESTED BEFORE RACE.
CONCRETE WALL
"SPINNING" WHILE CUTTING SPEED, WITH POSSIBLE COLLISIONS, MADE THE TURNS DANGEROUS.
SOFT EARTH TO RETARD CARS IF THEY HURDLE GUARD RAIL.
STEEL GUARD RAIL
7

the track requires over 1,200 twists and turns, compelling even the most daring drivers to slow up. The track features many safeguards to prevent the racing cars from crashing into the stands or spectators as they skid around the numerous turns.

Steel guard rails, supported by stout posts buried three feet in the ground, provide the first check. Beyond the rails is soft dirt, and then, a heavy wire fence that will stop the plunge of any car that hurtles the

[*Continued on page* 125]

AERIAL MEDICAL SERVICE

The Australian Aerial Medical Service maintains ambulance planes like this for bringing sick or injured colonists from isolated interior regions to medical centers. Doctor, pilot and wireless operator accompany each plane.

A traveling official using a portable field wireless set to summon medical aid from Cloncurry, Queensland, over 600 miles away. The masts held by the natives serve as an aerial. Power for sending the message is produced by using the pedal arrangement generator like a bicycle.

With power from pedaled generators, radio sets are used to summon or receive medical aid. Up to 200 miles, radiophone conversation is used. Over 200 miles, Morse code dots and dashes are sent out by an automatic keyboard when proper key is pressed. This device eliminates necessity for knowing codes.

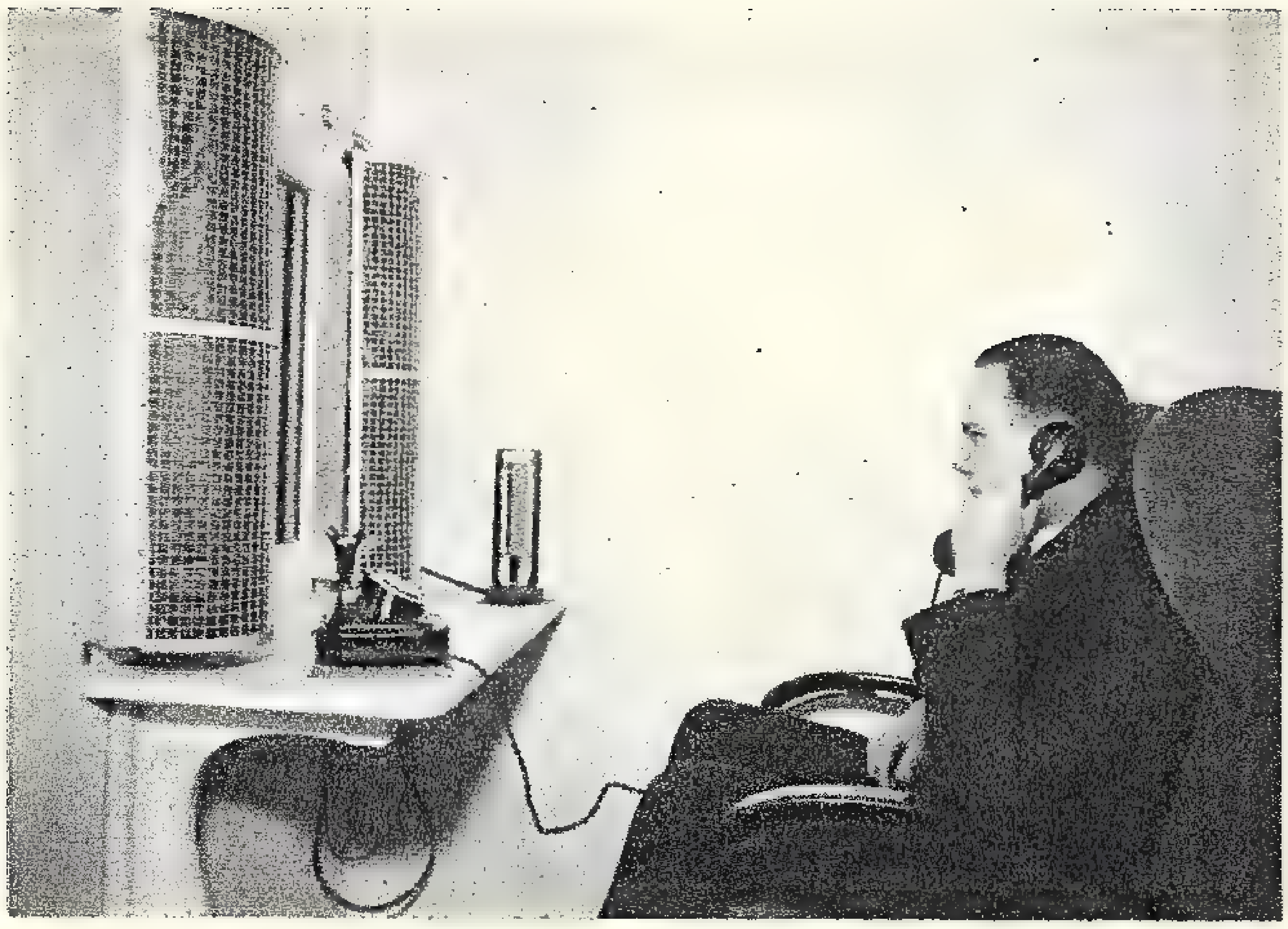
AIRCRAFT and wireless are being used to wipe out the medical dangers of isolation for large numbers of Australia's bush settlers located in the interior. To bring them speedy medical aid or advice, the Australian Aerial Medical Service utilizes several ambulance type airplanes, hundreds of cheap wireless sets, and four doctors.

The wireless sets, operated by responsible persons in each small settlement, summon the doctors' aid or advice from the nearest coast medical centers when needed. A single doctor flys as much as 20,000 miles in one year, visiting hundreds of patients, and holding group consultations at settlements.

Television Phone Links Two German Cities

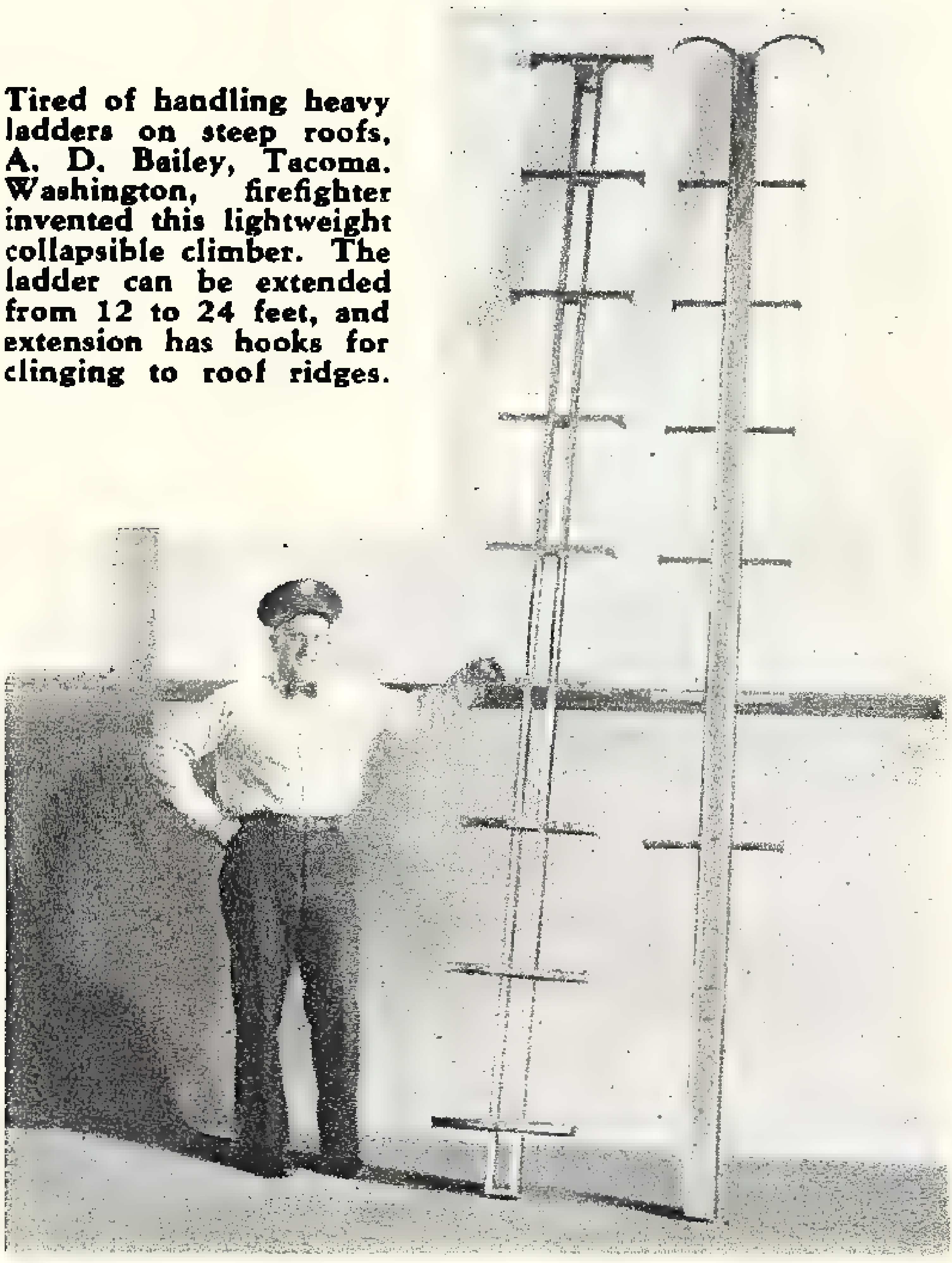
TELEVISION - TELEPHONE service having proved successful between Berlin and Leipzig, plans are being made to make the service available all over Germany.

Both persons can see and hear each other. A flicker type image of the other party appears on the panel directly in front of the person using the phone, while the sending apparatus, behind the screens on either side, records his movements and image. Work will start shortly on a similar service between New York and Philadelphia.



While talking to a friend 168 miles away in Leipzig, this Berliner is watching him, too, as his image appears on the screen in front. The television-telephone works both ways.

Ladder Aids Fire Laddie



Tired of handling heavy ladders on steep roofs, A. D. Bailey, Tacoma, Washington, firefighter invented this lightweight collapsible climber. The ladder can be extended from 12 to 24 feet, and extension has hooks for clinging to roof ridges.

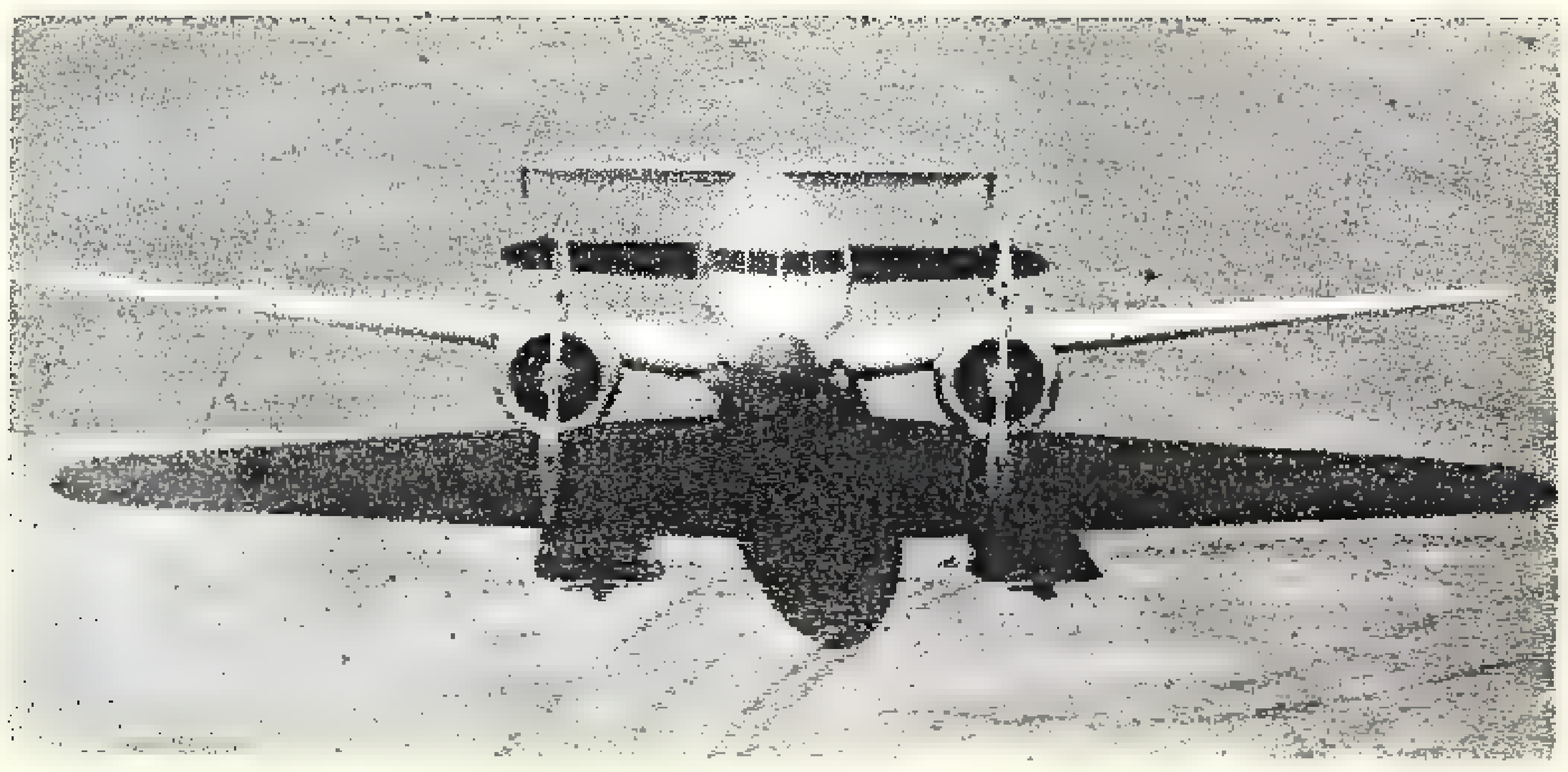
CONFRONTED with the problem of handling heavy ladders on steep roofs where the work required means of reaching beyond the 12-foot range of the standard ladder, Fireman A. D. Bailey of Tacoma, Washington, has invented a collapsible ladder which has been acclaimed and adopted by the Fire Department of his city. The ladder, of stainless steel, is 12 feet high, but pulls out to reach 22 feet. It can be swung from roof ridges.

Called Fastest Transport

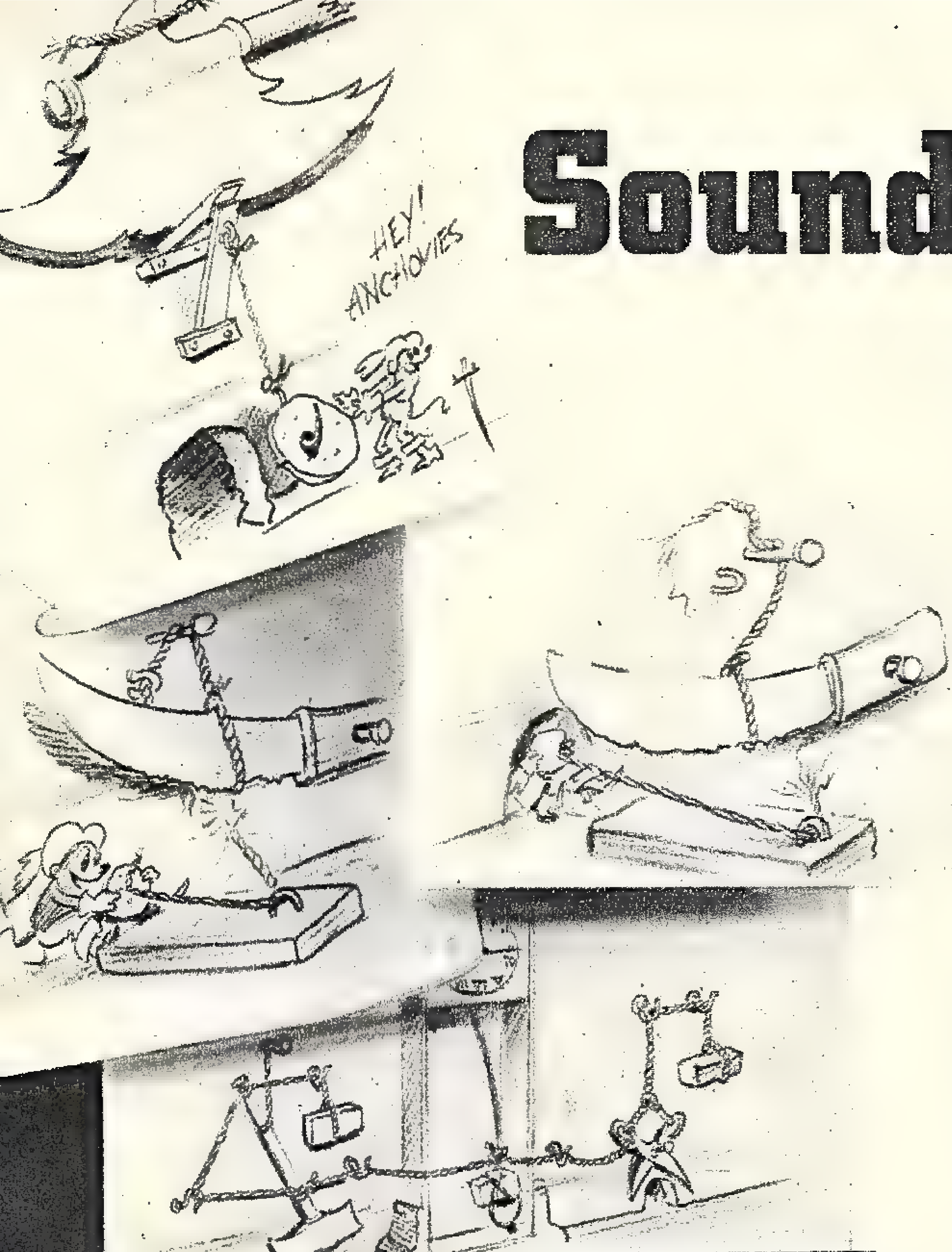
POWERED with two 450 h.p. Pratt & Whitney Wasp Juniors, Lockheed's new Model 12, is claimed by her makers in Burbank, Calif., to be the fastest commercial transport in service on the American airways.

Built to carry six passengers and two pilots, the new ship is structurally similar to the famous Lockheed Electra, although somewhat slimmer in line, about the nose and in the fuselage. The ship's maximum speed at sea level is 214 m.p.h., but at an altitude of 5,000 feet, she hums along at 226 m.p.h. Her cruising speed is 213, and the cruising range, with 200 gallons of gas, is 900 miles.

According to those who have ridden in the new model, she takes off rapidly, climbs at a phenomenal rate, and handles well at both low and high speeds. Landing, with flaps down serving as air brakes, the ship comes to a stop with a very short ground run.



New twin-engine model transport which her builders claim is America's fastest commercial plane. Built to carry six passengers and two pilots, its cruising speed is 213 m. p. h.



Sound Tricks of

by Earl Theisen

Illustrated by Walt Disney

Squeaks, squawks, oinks and music—it's another animated cartoon hit, set to music in a brand new way. Read how the hay baler joins a symphony.

The movies have long recognized the dramatic possibilities of Dumas' *Three Musketeers*. It took Walt Disney to recognize the humorous possibilities of the *Three Mouseketeers*. Here are four "rough sketches" which outline the action.

MUSIC and noises in the animated cartoon interpret the action of the story. The narrative theme of the music and what is called the "sound effects" punctuates and emphasizes the story.

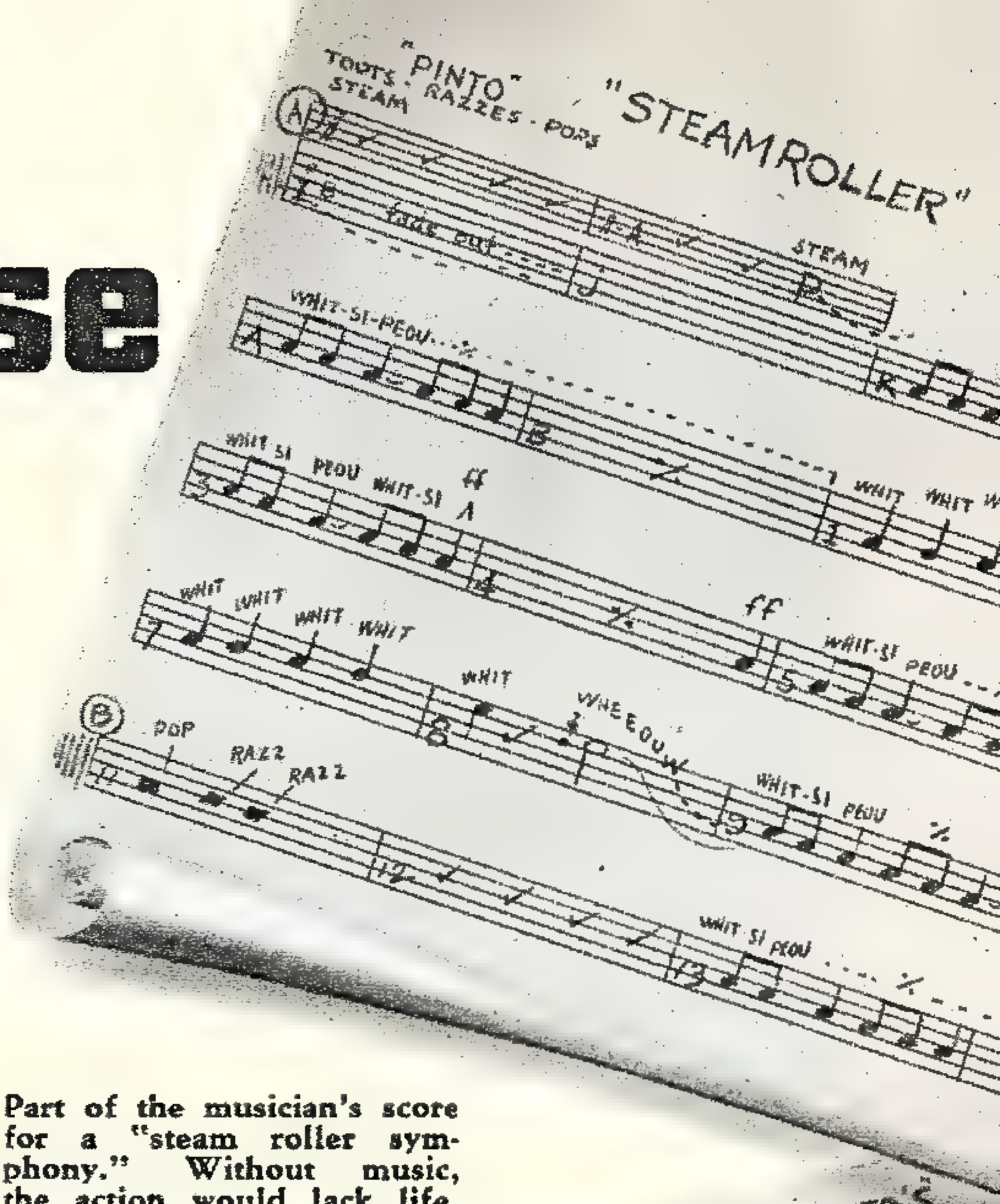
By playing on the aural nerves with symbolic sounds and noises the psychological reaction of the audience is controlled and varied according to the dramatic and emotional needs of the cartoon story.

If Donald Duck falls, for example, it is not enough for the sound man to hit a drum for the noise, but an additional sound characteristic must be added to convey a certain kind of fall. There are dozens of different "sound effects" for cartoon character falls which vary according to the story. When a sympathetic attitude is desired, the "fall" sound is hollow and devoid of jarring characteristics, while a harsh sound which shocks the aural nerves is created for that effect.

The associative value of sounds is widely used for humor, such as a tearing noise which

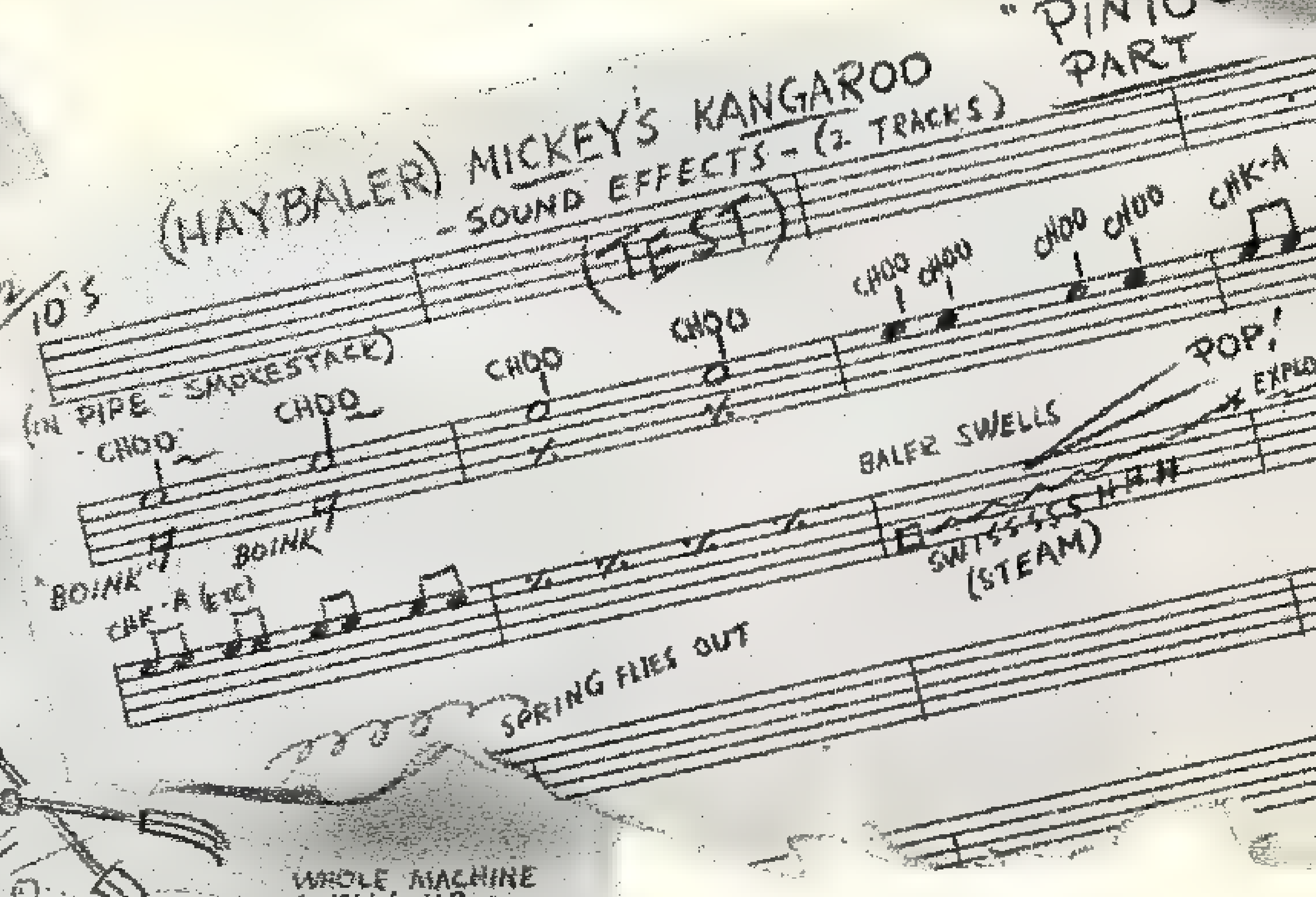
Copies of the "rough sketches" go to the cartoonists and musicians who build up the action and sound effects to the point illustrated. Above the results are being synchronized, and at right are some sound effect implements.

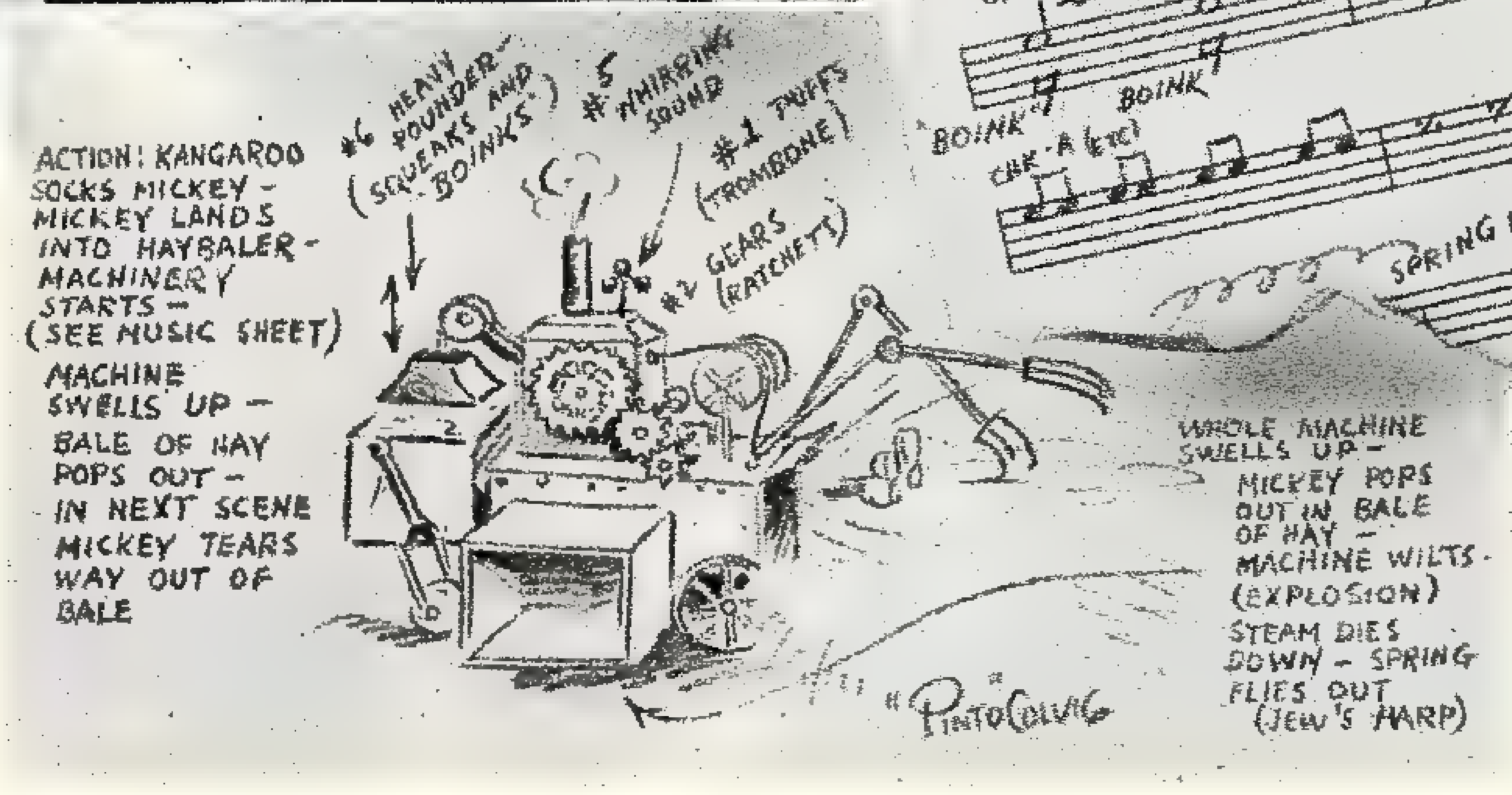
Mickey Mouse


"PINTO"
TOOTS STEAM
RAZZES - POPS
"STEAMROLLER"
STEAM
WHIT-SI-PEOU
WHIT SI PEOU WHIT-SI
ff
WHIT WHIT
WHIT WHIT WHIT WHIT
WHIT-SI PEOU
WHIT
WHEEOUW
POP
RAZZ
RAZZ
WHIT-SI PEOU
WHIT SI PEOU

Part of the musician's score for a "steam roller symphony." Without music, the action would lack life.

Walt Disney tempts a penguin into conversation with a strip of fish. Once the penguin begins to talk, his voice is recorded for movie cartoon use. This bird is heard in the film, *Peculiar Penguins*. All sorts of tricks are needed to persuade various animals to "talk."


(HAYBALER) MICKEY'S KANGAROO
- SOUND EFFECTS - (2 TRACKS)
"PINTO'S PART"
(TEST)
2/10's
(IN PIPE - SMOKESTACK)
CHOO
CHOO
CHOO
CHOO
CHOO CHOO
CHOO CHOO
CHK-A
"BOINK"
BOINK
CHK-A (ETC)
BALER SWELLS
POP!
EXPLO
SWISSSSHHH
(STEAM)
SPRING FLIES OUT


ACTION: KANGAROO SOCKS MICKEY - MICKEY LANDS INTO HAYBALER - MACHINERY STARTS - (SEE MUSIC SHEET)
MACHINE SWELLS UP -
BALE OF HAY POPS OUT -
IN NEXT SCENE MICKEY TEARS WAY OUT OF BALE
#6 HEAVY POUNDER - (SQUEAKS AND "BOINKS")
#5 WHIRRING SOUND
#1 PUFFS (TROMBONE)
#2 GEARS (RATCHETS)
WHOLE MACHINE SWELLS UP -
MICKEY POPS OUT IN BALE OF HAY -
MACHINE WILTS - (EXPLOSION)
STEAM DIES DOWN - SPRING FLIES OUT (JEW'S HARP)
"PINTO" COLVIG

The "rough sketch" at left was given to "Pinto" Colvig for the musical interpretation. Each moving part was turned into sound as shown on finished score above.

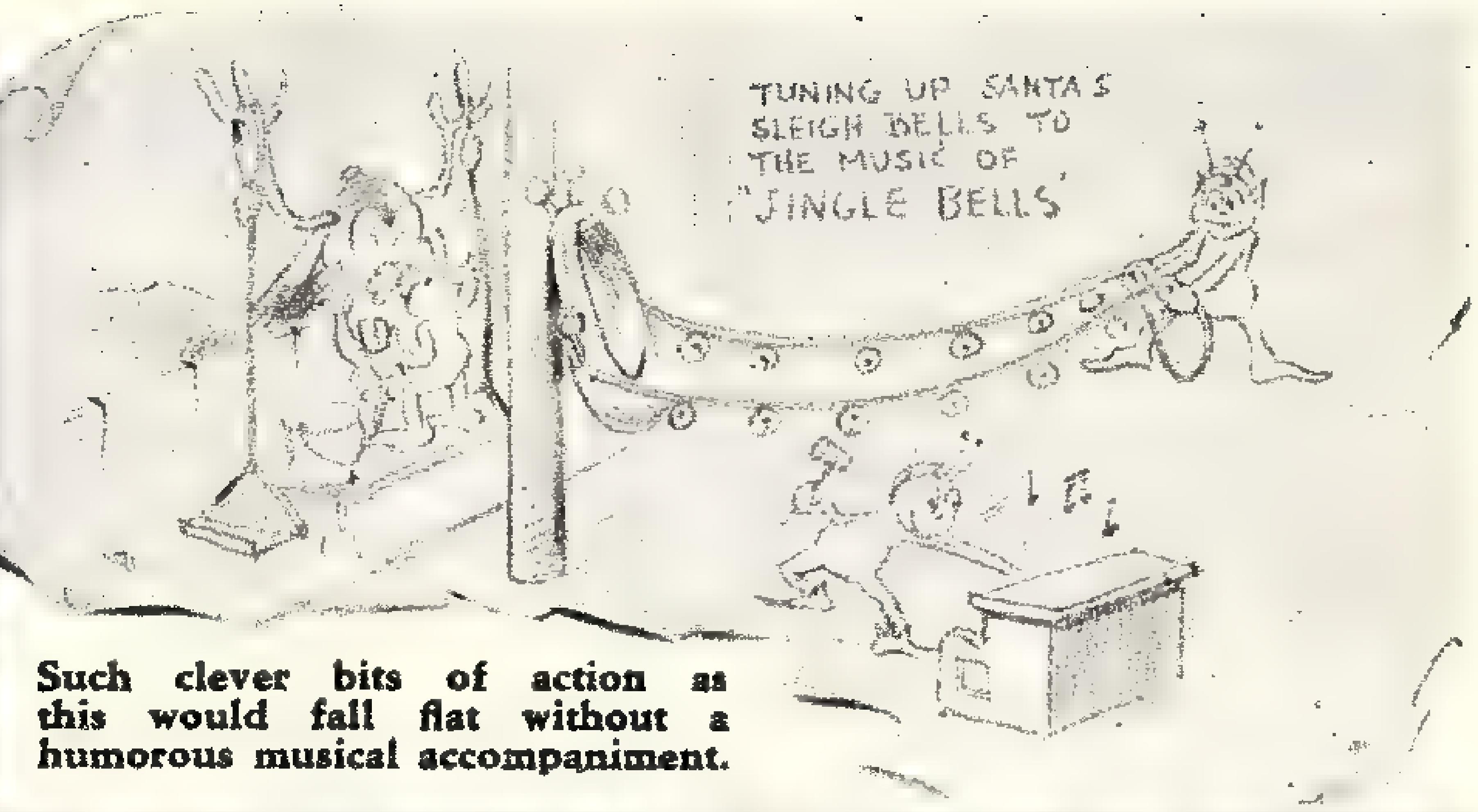
accompanies the falling of a character. For humorous responses the "sound effect" is often caricatured and distorted. An example of this was the tire skidding noise used in "The Tortoise and the Hare" when the fast moving rabbit slid to a stop.

Through study and experimentation Walt Disney and his engineers have found that by introducing music or various sounds and noise frequencies into the cartoon, the response of the audience is varied and controlled. By combining noises of certain pitches or tempos the psychological values of the cartoon music is emphasized in keeping with the story requirements.

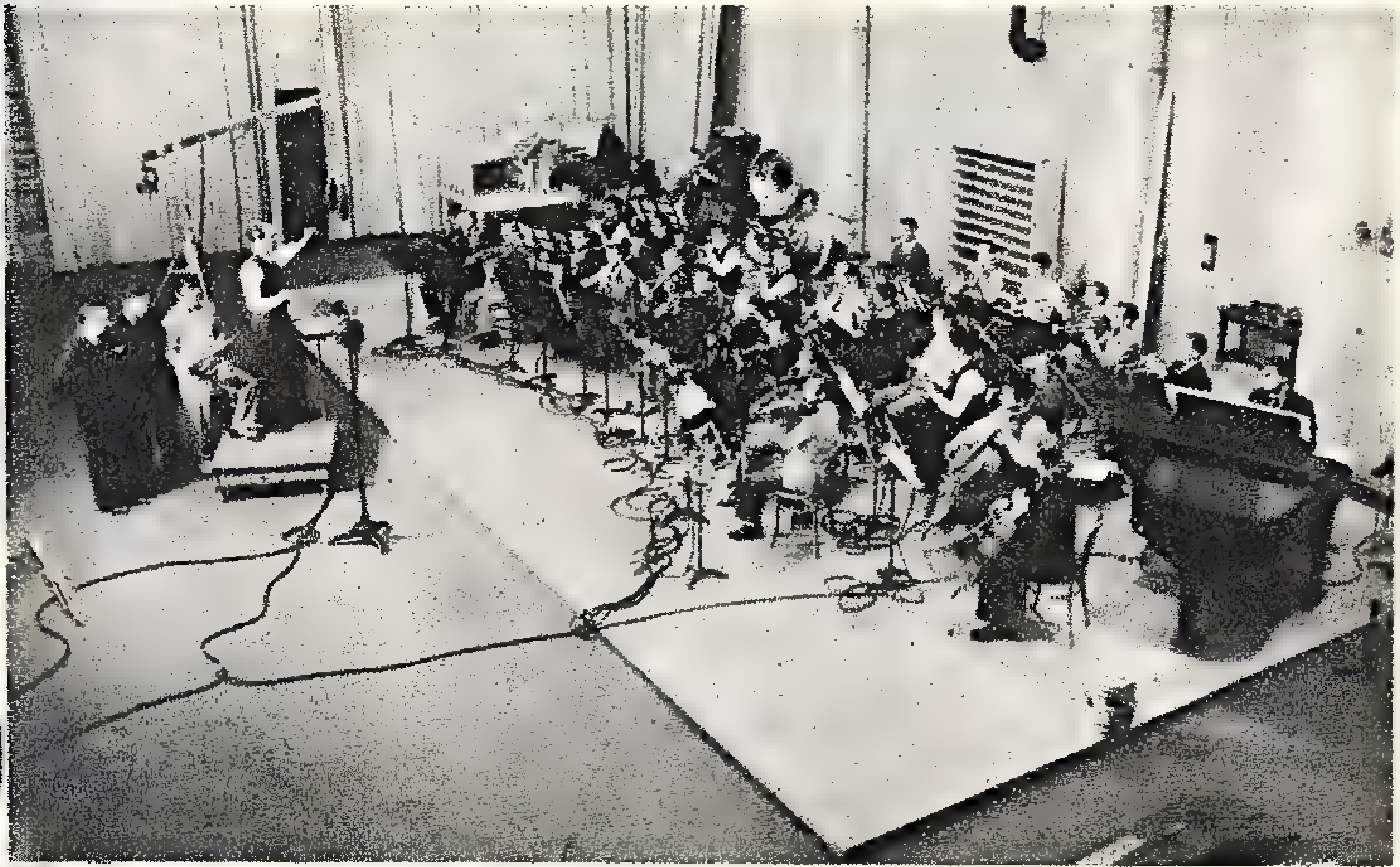
Sound of sixteen cycles is deep toned and may be used for conveying heavy or depressing moods, whereas the sound of a higher frequency is what William Garity, Chief Engineer at Walt Disney's, calls the "pain sensitive region." Noises of this higher pitch make the hearer alert and may be carried to the point of actually causing distress, such as a "file on glass" noise. The average ear is very sensitive to sounds of 2,000 or 3,000 cycles and unless some sound of this pitch is added to the cartoon background noise, the audience is less responsive to the effects.

Stories are told by sound. "Pinto" Colvig, who wrote the lyrics for "The Three Little Pigs" and who does many of the sound "imitations" for automobiles, airplanes, or machines when they assume human characteristics, is able to convey a whole story by sound. For example, in a recent picture he caricatured a steam roller at work by suitable noises, pops, puffs, razzes, and wheezes. Vocally, without the aid of mechanical de-

A last minute conference before recording. Disney and his director talk it over with the conductor.


TUNING UP SANTA'S SLEIGH BELLS TO THE MUSIC OF "JINGLE BELLS"

Such clever bits of action as this would fall flat without a humorous musical accompaniment.



The Silly Symphony orchestra on the special resonator floor which is used for special effects. Fifty or sixty hours of rehearsal are required in the production of the average film.

In the Monitor room the director, head engineer and Disney listen to the sounds produced on the sound stage. Here sound is reproduced exactly as it will be heard in the theater.

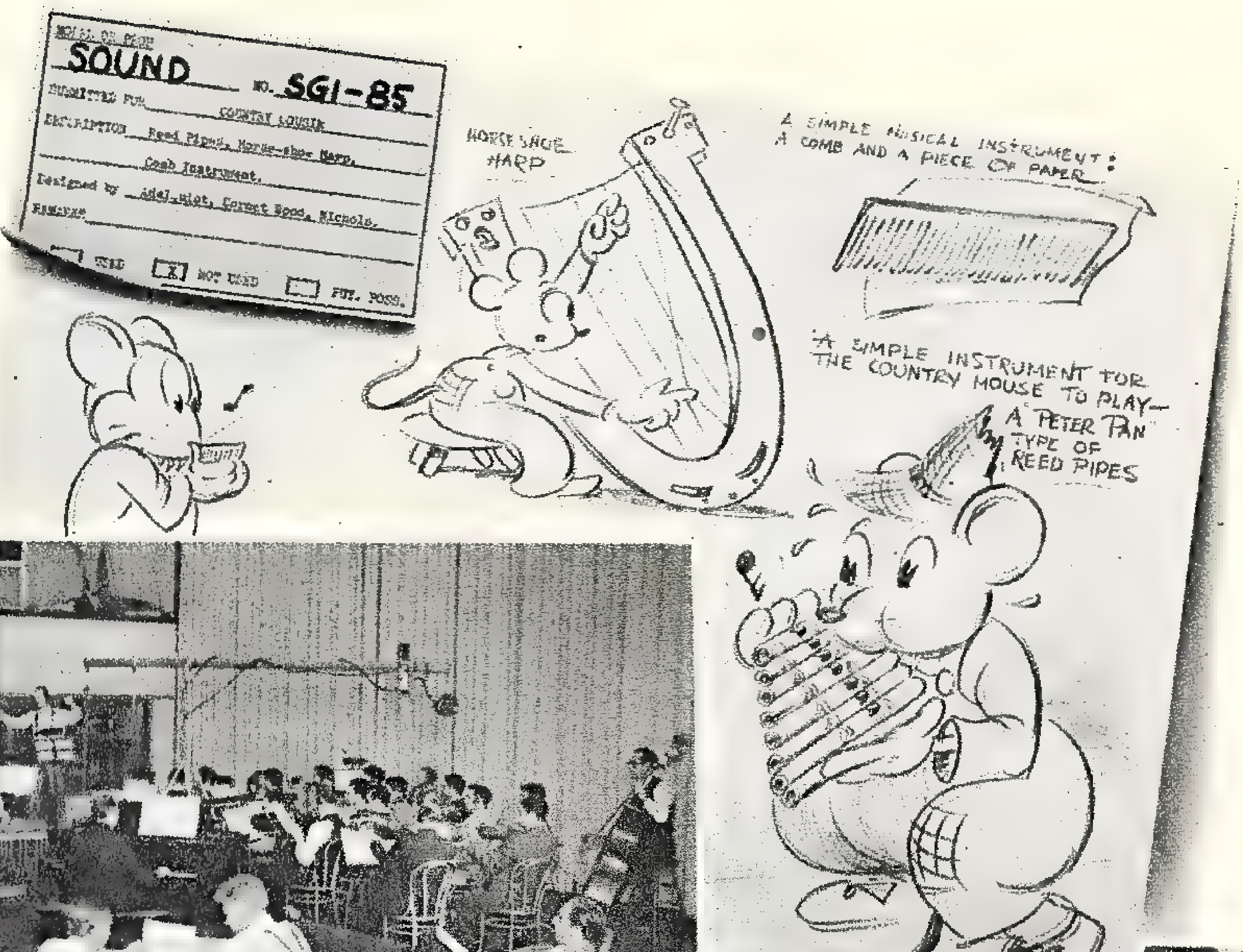
vices, he depicted a narrative episode of a very busy steam roller that worked hard, then got tired and stopped. To do this he made a picture on paper of the sound by working out the suitable suggestive sounds and inflections which he set down on music paper according to the desired effects, tonal range, and tempo which brought to life the pen and ink steam shovel. "Pinto" Colvig with the aid of a trombone and vocal sounds can make an airplane do all sorts of antics. Real airplane sounds cannot be controlled to musical tempo for cartoon effects.

Each sound in a cartoon film is the result of much thought. Such things as bugs, all sizes, getting the hiccoughs which happened in "Mickey's Garden" when Mickey sprayed them with "bug eliminator" required hours of rehearsal before the sound was recorded. For some sounds hours are required in rehearsal, and fifty or sixty hours are required to make the sound for the average cartoon.

There are six men and women under contract at Disney's who do nothing but mimic and imitate many sounds. The distorted Donald Duck conversation and singing is done entirely by mouth without mechanical aid, as is that of Madame Clara Cluck, Mickey, and the other characters. Walt, himself, does the Mickey chatter. Much of the "imitator's" time is spent in inventing cartoon noises.

For cartoon kisses, the "imitator" kisses his own hand or arm. For a Mickey-Minnie embrace, the "imitator" kisses the heel of his hand, while a tiny bug osculation is obtained from his thumb. A moist noisy smack is gained by kissing his arm at the elbow bend. Cartoon embraces are not as emotional as they are humorous because of the caricatured sound.

Each gag used in a Silly Symphony is selected from hundreds of others. The gag department contains thousands of inventions which will never be patented, for they operate only upon film for the amusement of theater patrons. Here are some ideas submitted for *The Country Cousin* but not used. They will be filed according to description on the card.



SOUND No. SGI-85

SUBMITTED FOR COUNTRY COUSIN

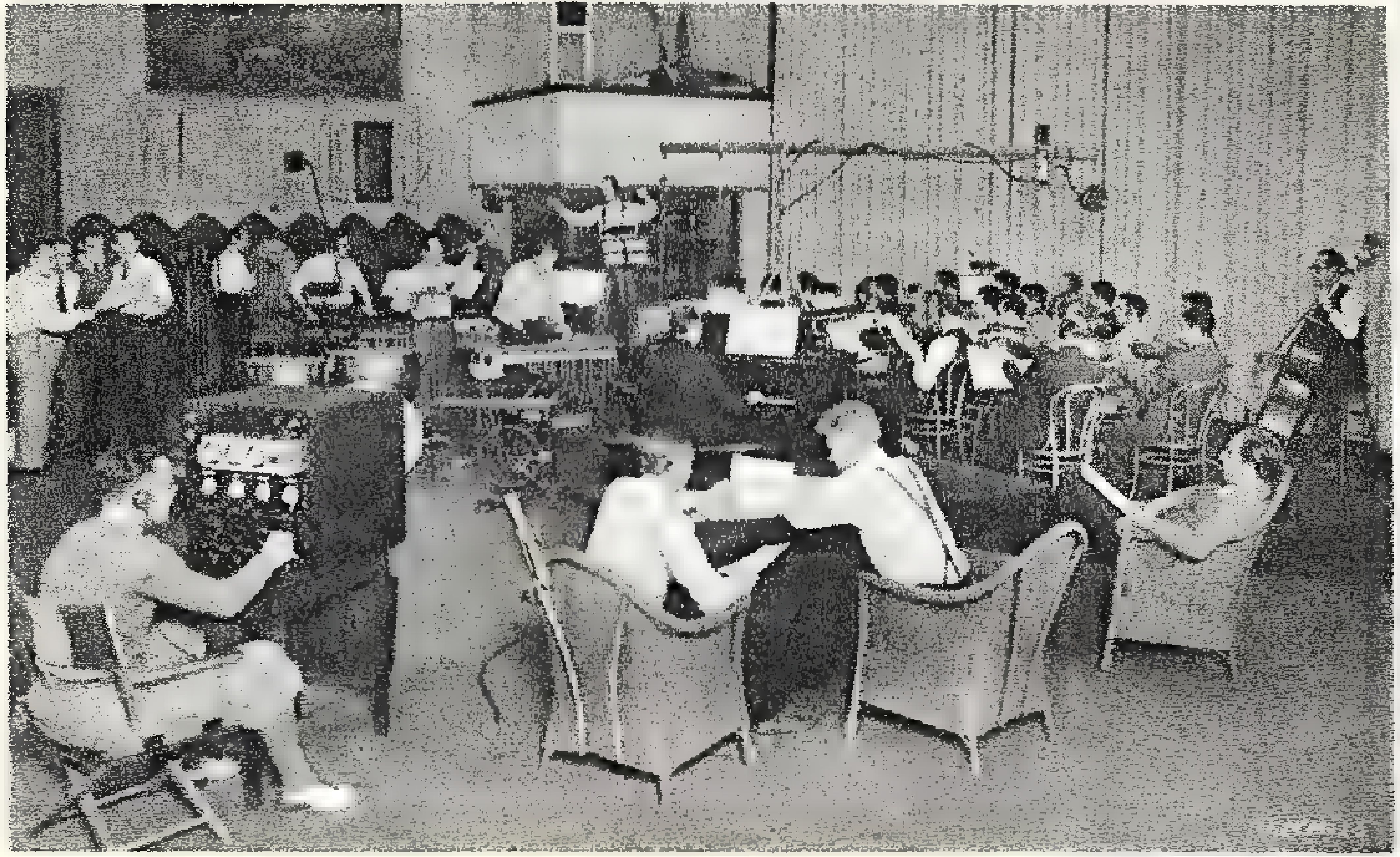
DESCRIPTION Reed Pipes, Horse-shoe Harp, Comb Instrument.

Designed by Adel, Eliot, Correct Wood, Nichols.

REMARKS

☐ USED ☒ NOT USED ☐ FUT. POSS.

HORSE SHOE HARP
A SIMPLE MUSICAL INSTRUMENT: A COMB AND A PIECE OF PAPER
A SIMPLE INSTRUMENT FOR THE COUNTRY MOUSE TO PLAY— A PETER PAN TYPE OF REED PIPES



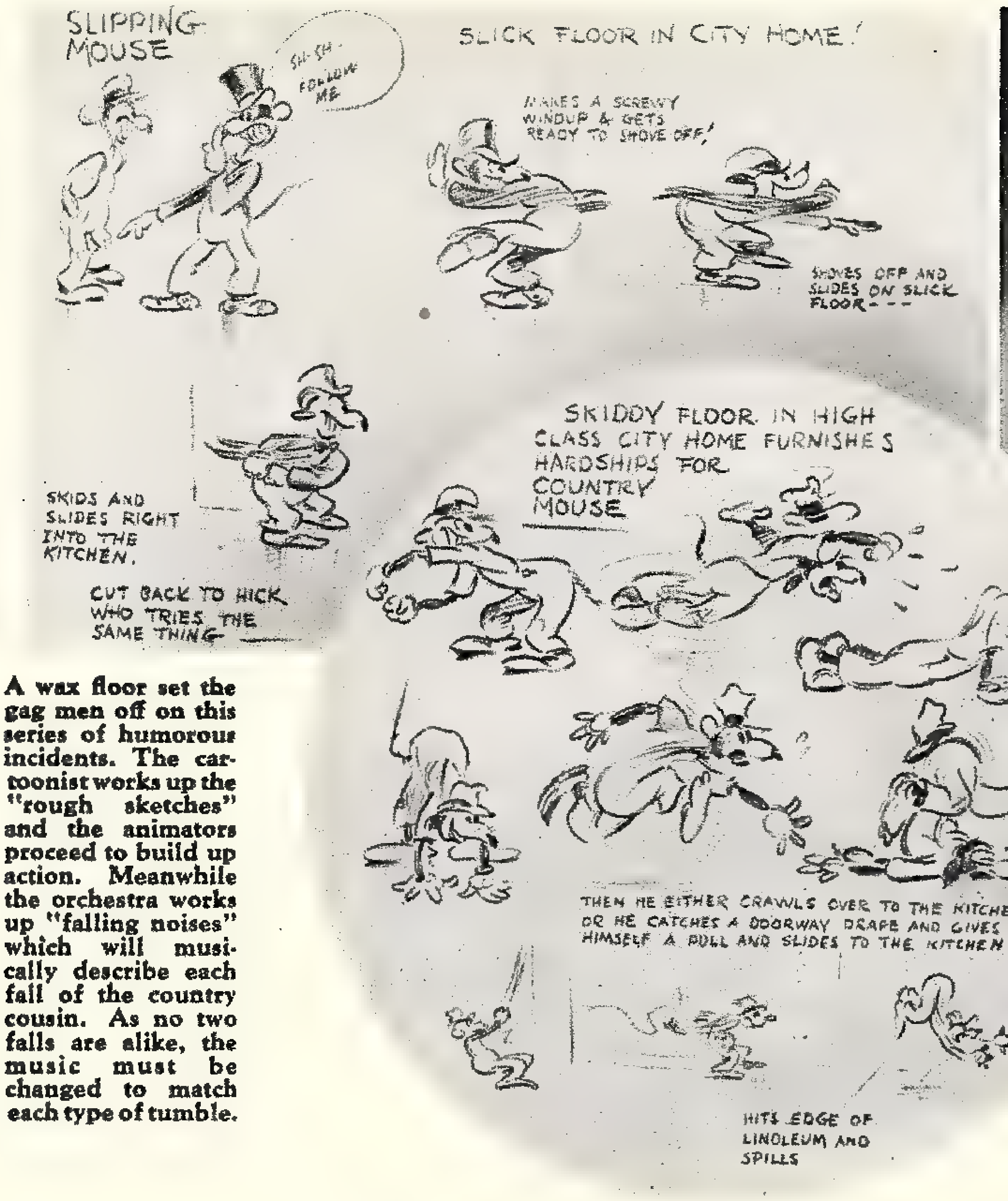
Here is a Silly Symphony in full swing, from the quartet at left and sound effects men at center to the orchestra at right. The panel at left "mixes" and blends the various sounds.

Now that music is carrying a big part of the action, the cartoon animator times his action to so many drawings per beat of music. The number varies according to the musical time.

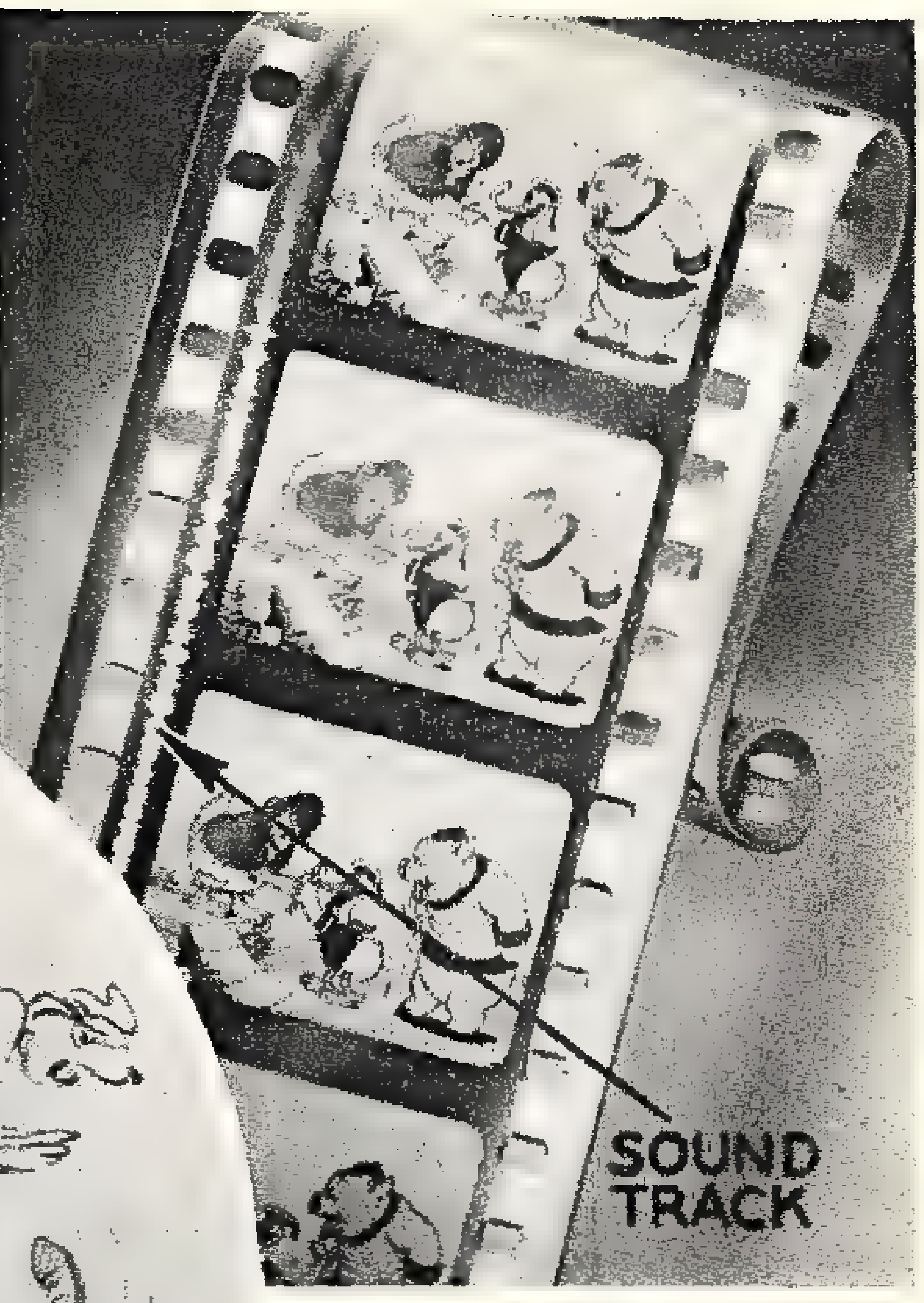
Recently a sound of a cartoon character talking under water was needed. After much experimentation, the sound was made by one of the "imitators" who talked while a common garden hose ran a stream of water into his mouth.

While much of the sound is made vocally, mechanical devices and various materials are also used. One kind of slow-burning fire noise is made by crinkling cellophane, while a more crackling fire sound is gained by twisting a bundle of bamboo strips. A train getting under way is obtained by a tin can in which is a handful of gravel. By shaking the can and gravel up and down, the noise of a real railroad train is created. Another "train noise maker" consists of a number of wires held at one end by hand. The other end of the wires is rubbed over a sheet of corrugated tin. Thunder claps of various kinds are obtained by cowhides and sheets of metal, while wind noises are made by rapidly revolving a wheel with wire spokes. Another hollow ghostly wind noise is made by revolving a wooden drum against taut silk. Rain noises are made in a drum in which are stretched piano wires. Particles of glass dropping against the wire when the drum is revolved creates the sound.

Lion roars are obtained from a barrel over which is stretched, drumlike, a piece of skin. Into the center of this skin is tied a heavy piece of cat-gut and the sound is made by sliding a rosin coated piece of leather down the cat-gut. Dog barks are made by similar though smaller contraptions. Various dog bark pitches are made by using assorted sizes of tin cans. The dog "language" is produced by the manner in which the rosined leather is slid on the string. Often ordinary tools such as egg beaters which furnish machinery noise, derby hats which supply thumping or more exactly a "plop in" sound, and so forth are used for suitable noises.


SLIPPING MOUSE
SH-SH - FOLLOW ME
SLICK FLOOR IN CITY HOME!
MAKES A SCREWY WINDUP & GETS READY TO SHOVE OFF!
SHOVES OFF AND SLIDES ON SLICK FLOOR---
SKIDS AND SLIDES RIGHT INTO THE KITCHEN.
CUT BACK TO HICK WHO TRIES THE SAME THING
SKIDDY FLOOR IN HIGH CLASS CITY HOME FURNISHES HARDSHIPS FOR COUNTRY MOUSE
THEN HE EITHER CRAWLS OVER TO THE KITCHEN OR HE CATCHES A DOORWAY DRAPE AND GIVES HIMSELF A PULL AND SLIDES TO THE KITCHEN
HITS EDGE OF LINOLEUM AND SPILLS

A wax floor set the gag men off on this series of humorous incidents. The cartoonist works up the "rough sketches" and the animators proceed to build up action. Meanwhile the orchestra works up "falling noises" which will musically describe each fall of the country cousin. As no two falls are alike, the music must be changed to match each type of tumble.


SOUND TRACK

The completed film looks like this. The sound track has been co-ordinated with the action, and upon that narrow strip depends as much of the success of the production as upon the pictures. These three frames reveal the tremendous amount of detail necessary to show Donald Duck accepting a lollypop. Thousands more are needed to complete the entire production.

For "squirrel conversation" a cork is twisted in a bottle with a "cartoon technique" in such a way that various meanings are conveyed. The squirrels may be made to seem excited, in love, or just chatting.

The sound stages where the recording is done are constructed of hard surfaced plaster board lined with blanket layers of mineral wool, felt padding, and matting interspersed with air pockets which aid in "damping" extraneous sounds. Thick layers of felt padding and carpeting are laid on the floor. There are two stages; one of which is entirely sound-proofed, or "damped," while a second stage is "live" in that it permits echos to reach the microphone.

Many devices are specially constructed in order that certain sound frequencies are dampened so the "imitator" has a better control over the pitch and volume of the noise. Special resonators in the pianos, doors set in elaborate resonating jams so "door-closing" noises may be made for cartoon purposes, and many other constructions are necessary.

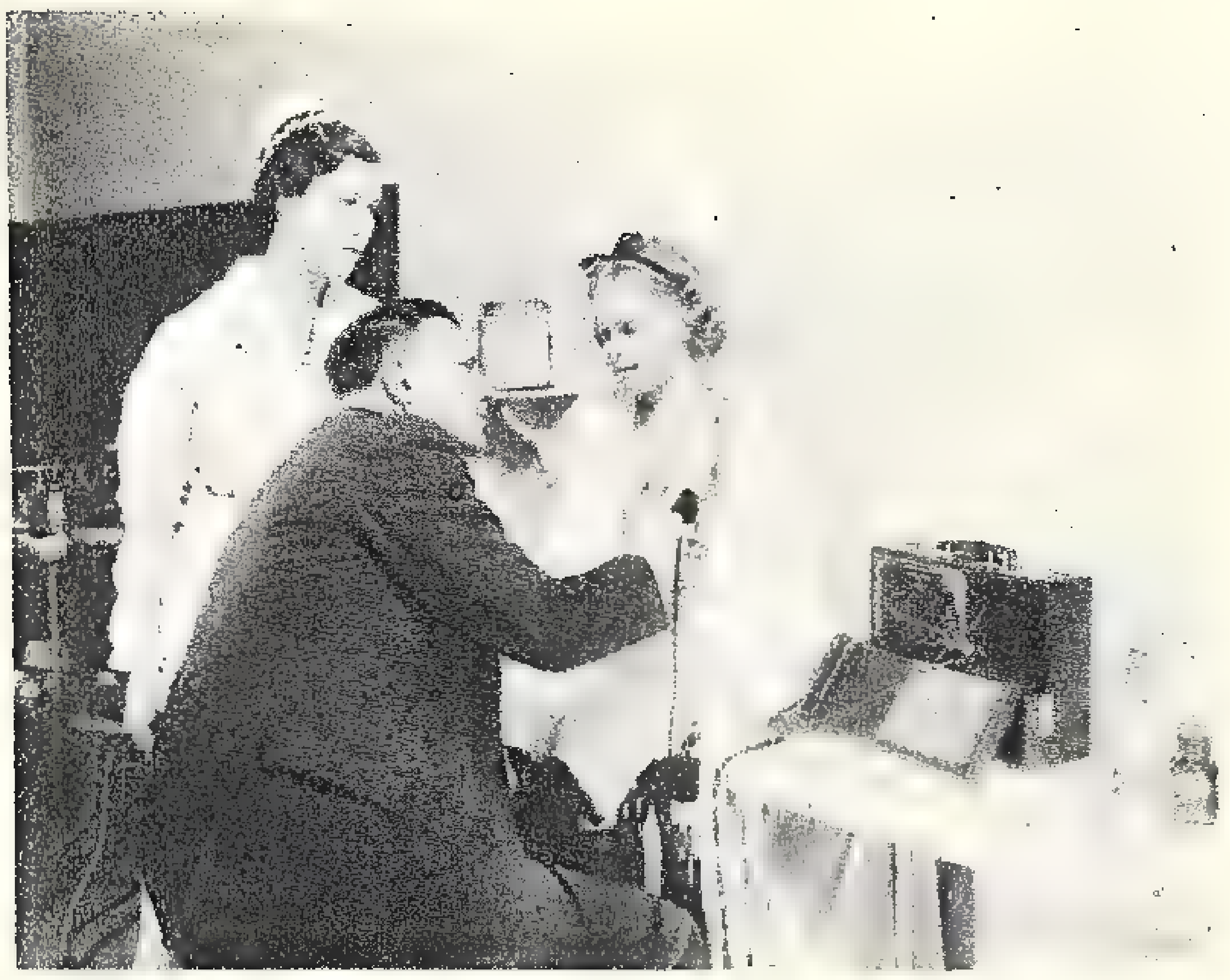
Even the Silly Symphony orchestra is set in a special resonator made of maple wood because of a required resonating quality of this wood. The resonator which gives a richness to the tone is built in the form of a large tapering loud speaker on one of the sound stages. It is suspended in a floating arrangement so as to eliminate echo vibration. Walt Disney, who knows the dramatic value of various sounds and musical tempos, has constructed many novel devices in order to produce the necessary sounds.

The background orchestral music is valuable in directing the emotional responses of the audience, and is used to elaborate on the cartoon story by what Walt Disney prefers to call the "earical illusion." The psychological reactions of the theatre audience to suggestive noise, musical tempo and tune are carefully considered in composing musical scores for the animated cartoon.

The emotional effect is gained not so much by the music itself as by the manner in which it is played and the noise effects instilled into the orchestration. In connection with the villain, for example, an annoying "out of step" sound is cleverly interwoven into the background music melody is "timed" into the musical effects.

[*Continued on page* 122]

Electrical Stethoscope Helps Doctors Diagnose



Through the use of this electrical stethoscope, developed by Western Electric Company, physicians can hear heart murmurs formerly impossible to detect with ordinary stethoscope.

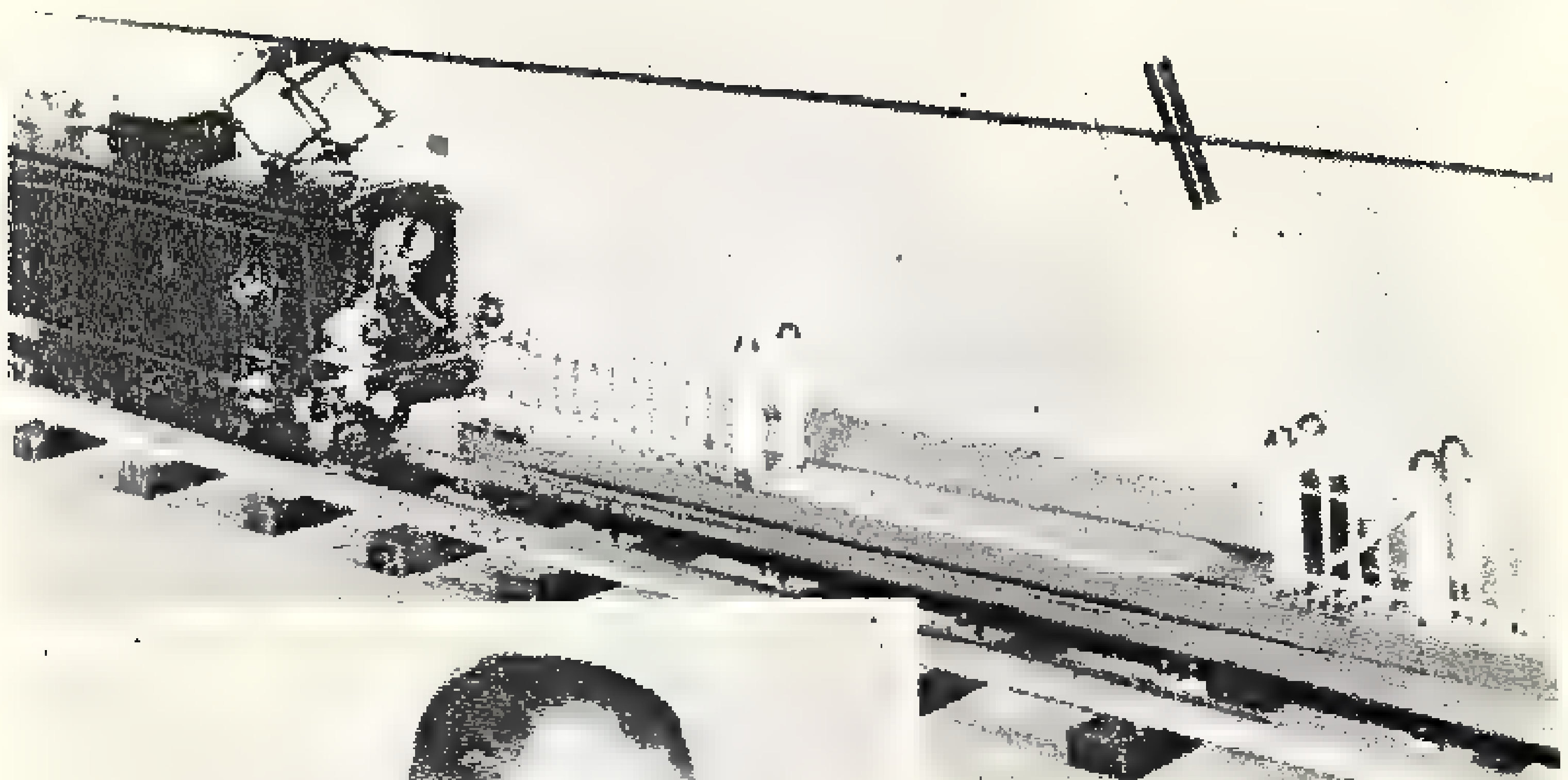
AN ELECTRICAL stethoscope that enables physicians to greatly amplify heart sounds in making a diagnosis has been devised. It features a filter circuit that isolates and accentuates murmur sounds so significant and yet so difficult to detect with an ordinary acoustical stethoscope.

The electrical stethoscope, developed by the Western Electric Company, is in reality an amplifier with a special microphone which is applied to the patient's body over the heart. The faint impulses picked up by the microphone are fed into the small, but powerful, amplifier and are magnified to desired degree.

The output of the amplifier passes into a receiver arranged for attachment to the earpiece of the conventional type of stethoscope which the examining physician applies to his ears in the usual manner. Doctors claim they can now hear internal murmurs that were formerly difficult or impossible to detect.

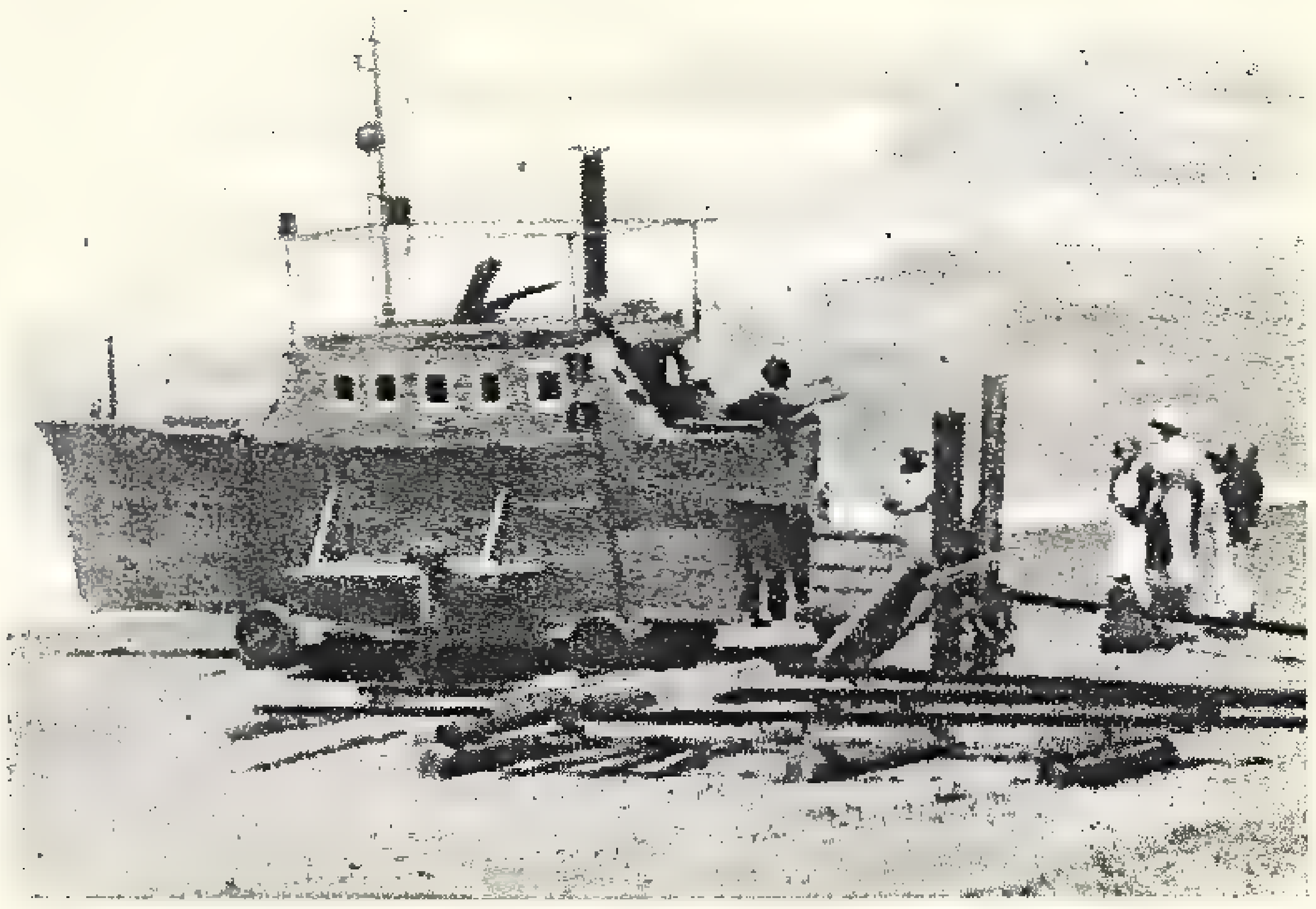
Device May Stop Crashes

DESIGNED to eliminate railroad grade crossing accidents, a safety device developed by Alfred Huguet, of Barcelona, Spain, is said to have proved its practicability in a test using model trains. An electric eye switch in the locomotive causes the power to shut off if the train approaches within a certain distance of a crossing at which the guard gate has failed to lower.



Left—Alfred Huguet, Spanish inventor, has developed a safety device that may eliminate railroad grade crossing accidents. It can be applied to either steam or electric powered locomotives. Above—Model train used to demonstrate Huguet's device. When train approaches a crossing at which gate has failed to lower, a switch located in the engine cab automatically turns off power and applies the brakes to train wheels.

Boat Devised From Scraps

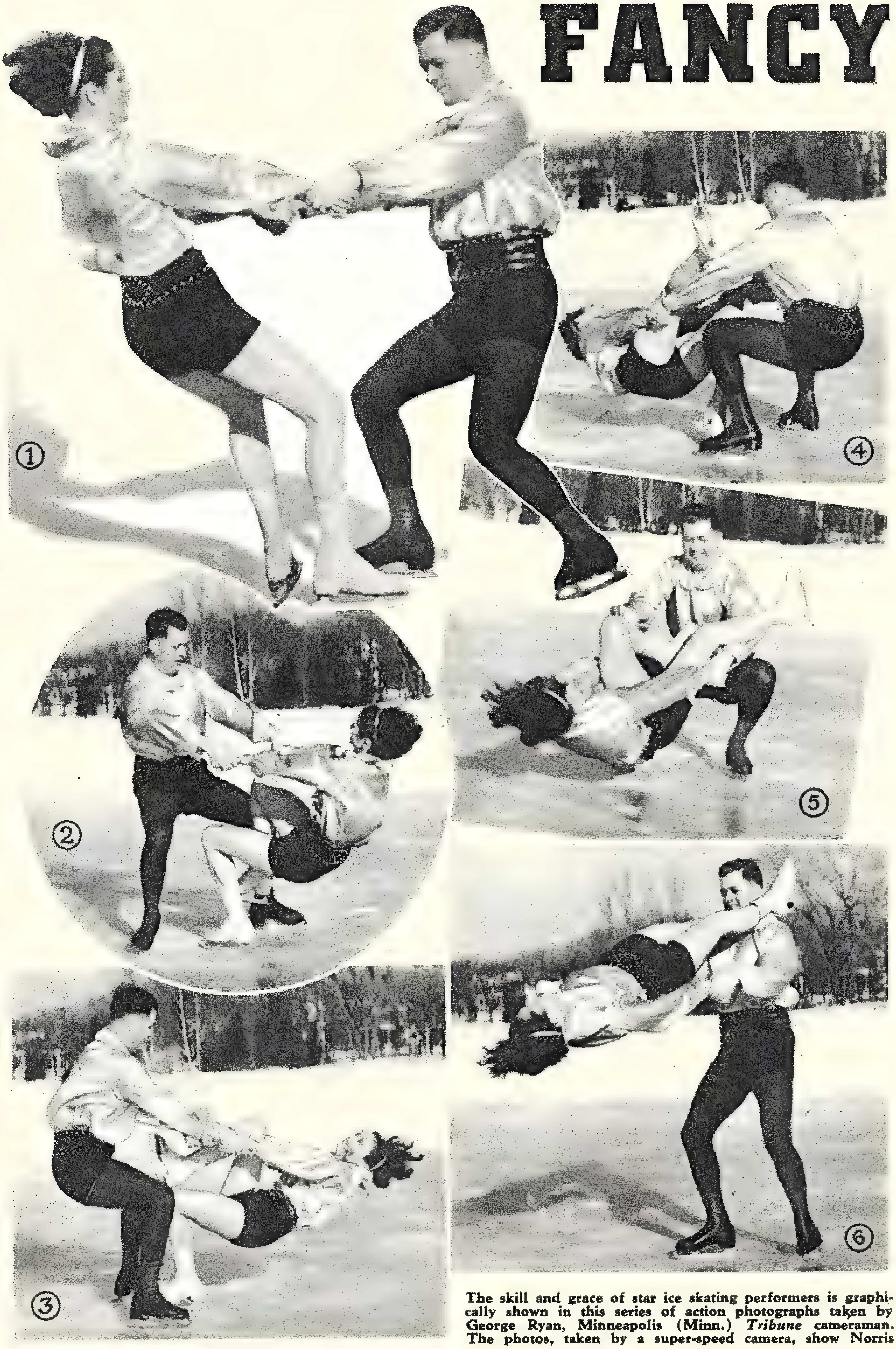


Two beach-combers at Fort Bragg, Calif., will brave the oceans in this queer looking boat. They hope to sail it to Europe. Made of scraps from city dumps, it required ten years to build.

CONSTRUCTED entirely of scrap materials obtained at city dumps, an odd looking boat awaits launching at Fort Bragg, Calif. It was constructed by two beach-combers who hope to sail to Europe in it.

The 25-foot craft required ten years to build and weighs over four tons. More than 15,000 rivets hold it together. A lookout platform atop the cabin is equipped with an old automobile headlight which will serve as a searchlight in an emergency. Boat is now standing on railroad wheels on an improvised track awaiting a calm sea before the beach-combers attempt the start of their hazardous trip.

FANCY



The skill and grace of star ice skating performers is graphically shown in this series of action photographs taken by George Ryan, Minneapolis (Minn.) *Tribune* cameraman. The photos, taken by a super-speed camera, show Norris

SKATING

⑦

⑩

⑪

⑧

⑨

⑫

and Naome Wold going through the evolutions of the "puck spin" at Lake Of The Isles in Minneapolis. Fancy skating calls for a degree of skill and precision second to that of few other activities. Speed, balance, strength, endurance—all are required of those who would perform on the flashing blades. A slip here, a moment's hesitation there, and what started as a graceful exhibition is turned into an awkward, stumbling display. Constant, painstaking practice is necessary.

Sportsmen's

TACKLE For Salt

UNLESS you are familiar with sea fishing the selection of the proper tackle is open to conjecture. There are so many sea fish, all of which fall into many and various divisions such as large, medium and small, some mad tearing and others just a little bit better than very active. All of these species have to be taken into consideration when selecting sea-fishing tackle.

Needless to state the tackle to be used for sea fishing must be picked according to the size of the fish one is after. Obviously the very large fish, such as the marlin swordfish, the sailfish, the tarpon and the tuna (all racy fish of tackle-testing proportions and activity) demands the stoutest and most enduring tackle. For such fish a double enamel tip of 60 inches and a weight of approximately 14 to 16 ounces is a suggestion. The butt length will be 20 inches, or the rod, with butt in place, measuring 6 feet 8 inches over all. With a rod of the sort a 9-0 reel or heavier is a suggestion. A 36 to 38-thread cuttyhunk line is often used although lighter lines are selected by those practiced in the use of medium weight tackle.

Medium weight tackle is used in the taking

Circle—Hooking a tarpon is synonymous to roping a wild mustang. When the strike occurs, the great fish leaps high out of the sea in efforts to shake off the hook, then the fight is on. Below—A sextette of big ones soon to become swordfish fillets. In Southern California waters, where these pictures were taken, monster, man-eating sharks often bite chunks from the fish before it can be hauled aboard the boat.

Campfire

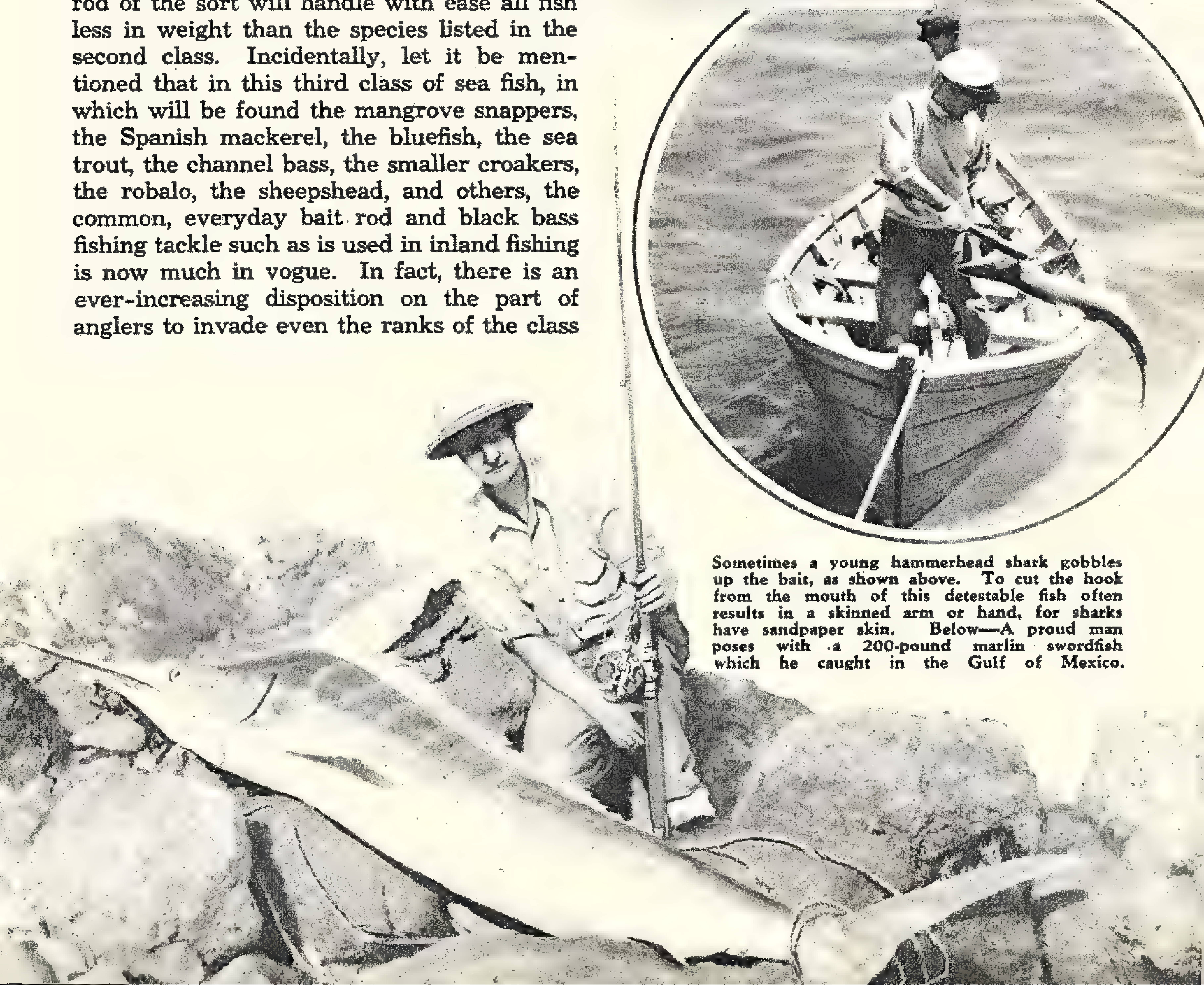
Water FISHING

by
Robert Page Lincoln

of such fish as the barracuda, the amberjack, the great kingfish, California yellowtail, crevalle and others. *The rods for this* purpose should range from 10 to 14 ounces, with a 6-0 reel to keep it company. A 24 to 30-thread cuttyhunk line is a practical suggestion. A double enamel rod is not needed for this department, the single enamel rod being suitable and not too light. A tip in this class weighing 9 ounces has a length of 60 inches.

A lighter rod, one ranging 7 to 10 ounces in weight will take a 4-0 reel, with a cuttyhunk linen line of from 15 to 21 threads. A rod of the sort will handle with ease all fish less in weight than the species listed in the second class. Incidentally, let it be mentioned that in this third class of sea fish, in which will be found the mangrove snappers, the Spanish mackerel, the bluefish, the sea trout, the channel bass, the smaller croakers, the robalo, the sheepshead, and others, the common, everyday bait rod and black bass fishing tackle such as is used in inland fishing is now much in vogue. In fact, there is an ever-increasing disposition on the part of anglers to invade even the ranks of the class

Whe-e-e-e-e-e! sings the reel in the song of the strike. Out behind the boat is a warrior in a writhing, silvery dance—a cyclone on a leash!



Sometimes a young hammerhead shark gobbles up the bait, as shown above. To cut the hook from the mouth of this detestable fish often results in a skinned arm or hand, for sharks have sandpaper skin. Below—A proud man poses with a 200-pound marlin swordfish which he caught in the Gulf of Mexico.

two fish with this comparatively light tackle. The bait rod of the bass type is now something of an institution on all coasts, Pacific and Atlantic and in the Gulf of Mexico. In class three will be found fish ranging from five to fifteen pounds in weight.

Mention of the everyday black bass bait casting rods as used in sea fishing, in the inlets, bays, and in the river mouths along the coasts, should bring out the fact that while the typical bamboo rods may be used, these should be in the double enamel class which gives them considerable strength. The seamless tubular steel rods are especially suitable to salt water fishing in that no salt moisture can get inside of the same to rust the interior and so making for a broken rod.

A regulation bait casting reel holding 100 yards of hard braided silk line is used in this salt water fishing, ranging 18-pound to 25-pound test. Owing to the fact that the saline influence of the sea has its effect on the silk the result is that, regardless of its merits, it will deteriorate. The usual method is to wash the line in fresh water after coming in from a trip on the briny deep.

A few years ago there were but few of our typical black bass plug lures being used in salt water fishing. Now they are sold by the thousands in every salt water fishing location, especially around the Florida coasts and in the Gulf of Mexico from Naples, Florida to Brownsville, Texas. While various underwater lures have their champions in salt water fishing as it is practiced with our inland, fresh water bait casting rods and regulation black bass tackle, still the type of lure that is mostly in demand are the various surface lures, the variety that can be "popped" on the surface. A lure of the sort floats when not in action. By reason of a raised collar, a scoop in the wood at the head, double-jointed effect, or some other means which will agitate the water, it is used to wonderful effect. The lure is cast and then, as it is reeled in, it is

[*Continued on page* 120]

In a single day, between dawn and dusk, this trio sailed back to camp with 4 sailfish and 4 marlin, all caught in deep water off San Pedro Island, California.

One of the most vicious and dangerous sea fighters is the Manta Reya, often called the blanket fish, which inhabits the waters off the Coast of Mexico. The monster shown below measures 24 feet across and is 8 feet thick. He is caught from a large boat, but is often accidentally hooked by dory fishermen. But wise to the ways of this vicious fish, they cut the line and row out of the vicinity. These fish swamp small boats.

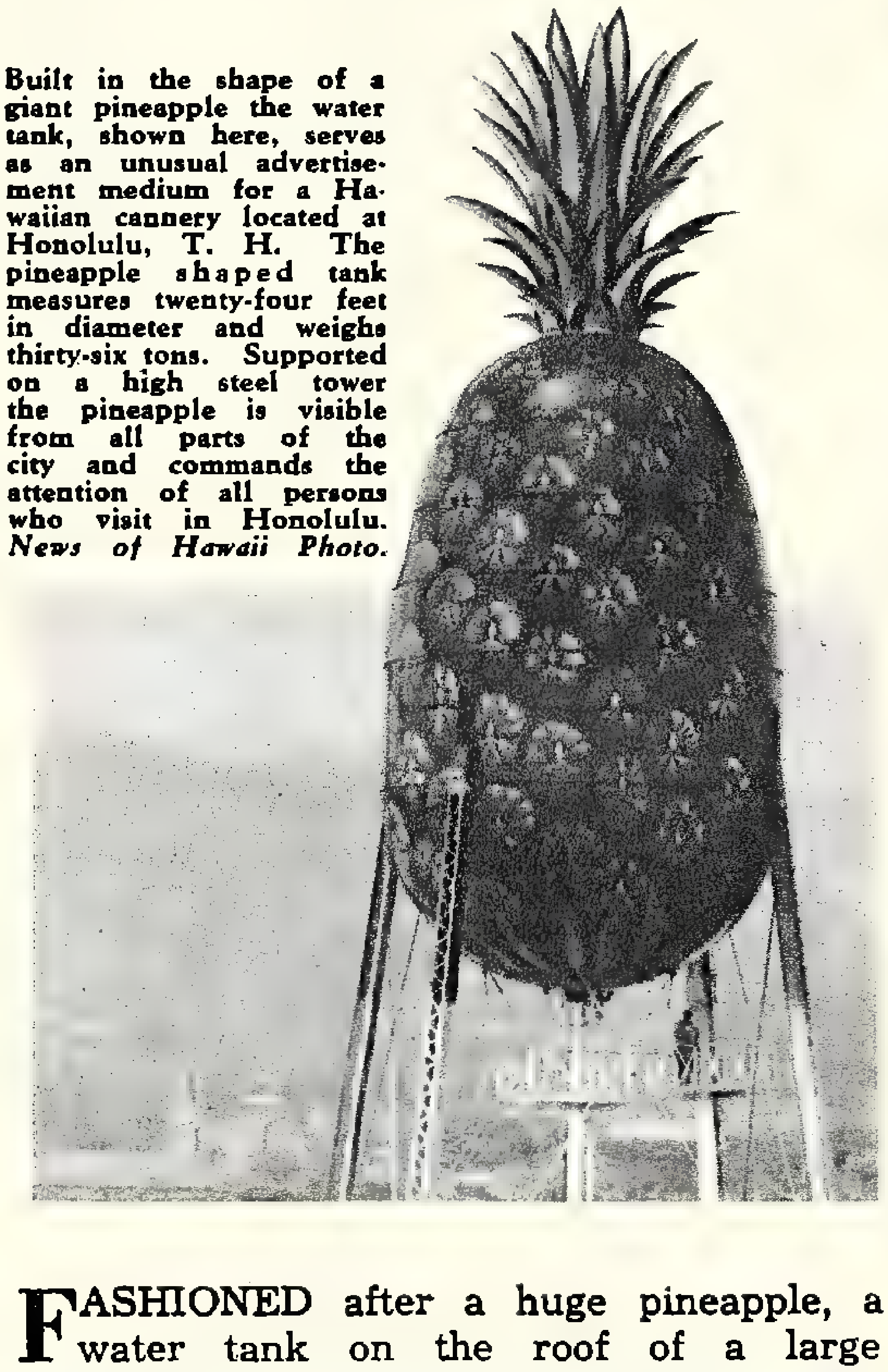
IODINE VAPOR DETECTS FINGERPRINTS

SCIENCE again has played an important part in the war on crime with the invention of the iodine vapor fingerprint detector by two Pasadena, California, men. Working with the assistance of Lieut. R. S. Sears, of the Pasadena Police Department, Dr. John McMorris, a chemist, has perfected a device which reveals fingerprints simply by blowing on them.

The instrument consists of a glass thistle tube containing calcium chloride. When the breath is blown through the rubber hose it is heated by the calcium chloride which then absorbs the iodine fumes in another portion of the tube and projects them on the fingerprint surface. The vapor detector has gained the attention of police officials everywhere.

Huge Pineapple Water Tank

Built in the shape of a giant pineapple the water tank, shown here, serves as an unusual advertisement medium for a Hawaiian cannery located at Honolulu, T. H. The pineapple shaped tank measures twenty-four feet in diameter and weighs thirty-six tons. Supported on a high steel tower the pineapple is visible from all parts of the city and commands the attention of all persons who visit in Honolulu. *News of Hawaii Photo.*

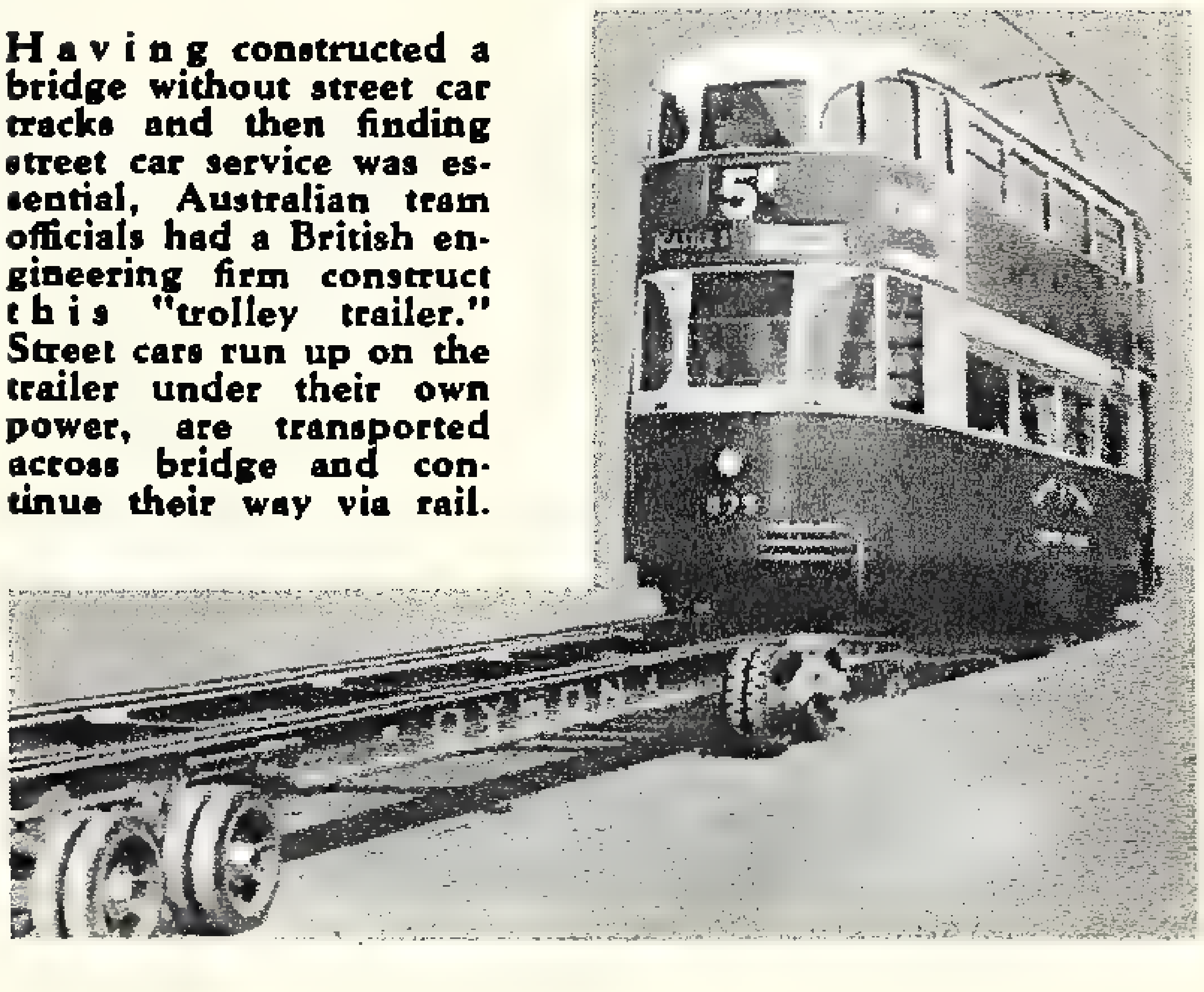


FASHIONED after a huge pineapple, a water tank on the roof of a large Hawaiian cannery is the cause of much comment by visitors to Honolulu. Visible from all parts of the city the pineapple looks as natural as the actual fruit. Supported on a tall steel tower the tank measures twenty-four feet in diameter and sixty feet high.

When the breath is blown through this apparatus iodine fumes are given off and fingerprints immediately show up. Dr. John McMorris is shown demonstrating the device to an assistant.

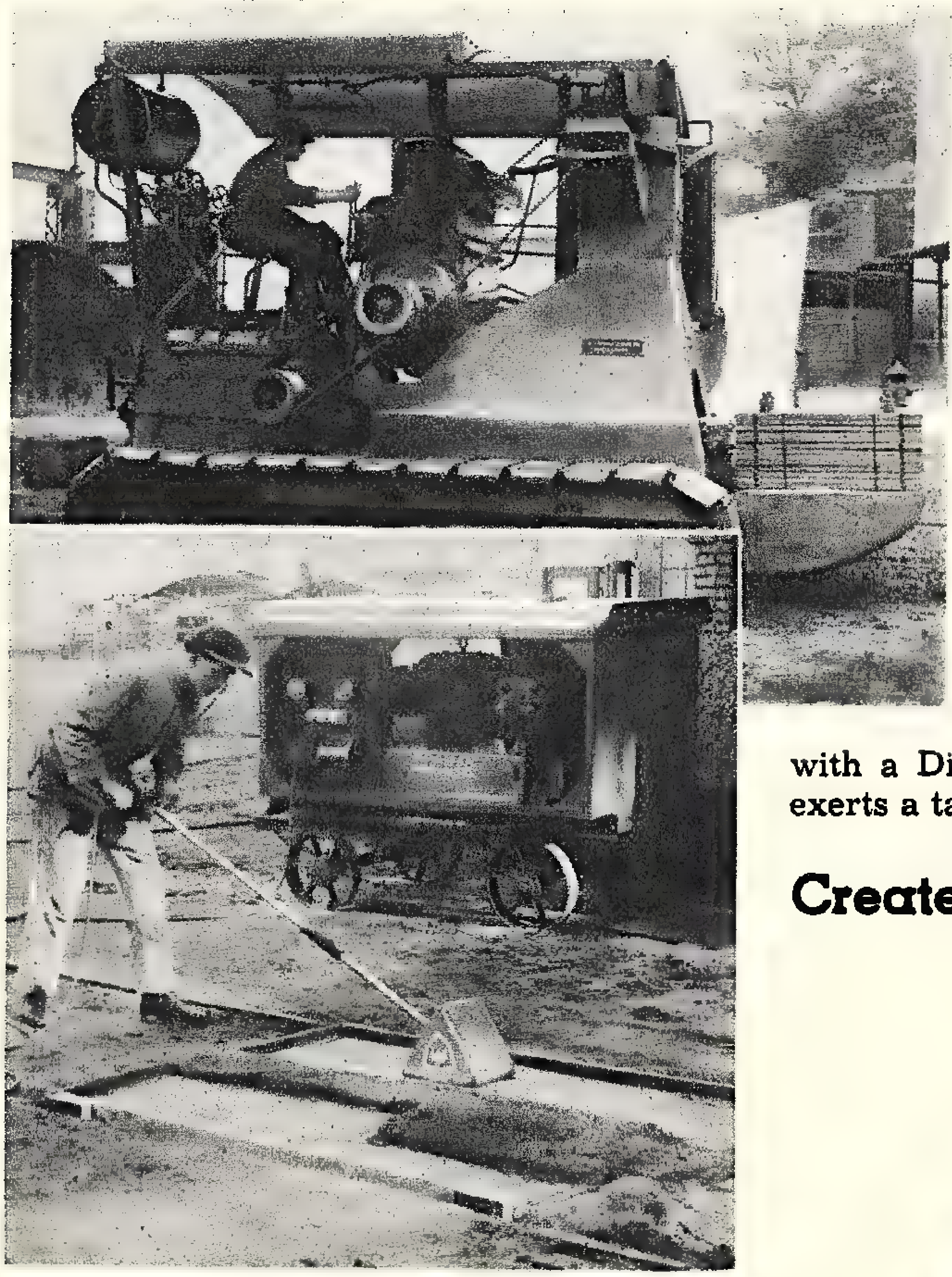
Cars Use Trackless Bridge

AFTER designing and building of the famous harbor bridge at Sidney, Australia, had been completed engineers realized that they had overlooked the installation of street car rails. As a result one of the city's important lines was severed and to lay tracks over the completed bridge would have been next to the impossible. An English engineering firm in Liverpool was called on to solve the problem and as a result service has been restored through the use of motorized "trolley trailers."



Having constructed a bridge without street car tracks and then finding street car service was essential, Australian tram officials had a British engineering firm construct this "trolley trailer." Street cars run up on the trailer under their own power, are transported across bridge and continue their way via rail.

Vibrator-Tamping Machines Develop Great Power



Top—Equipped with a 100-horsepower Diesel engine, this machine tamps down new asphalt and concrete roads with a tamping pressure of 60,000 pounds. Bottom—This hand operated tamper exerts 600 pounds pressure.

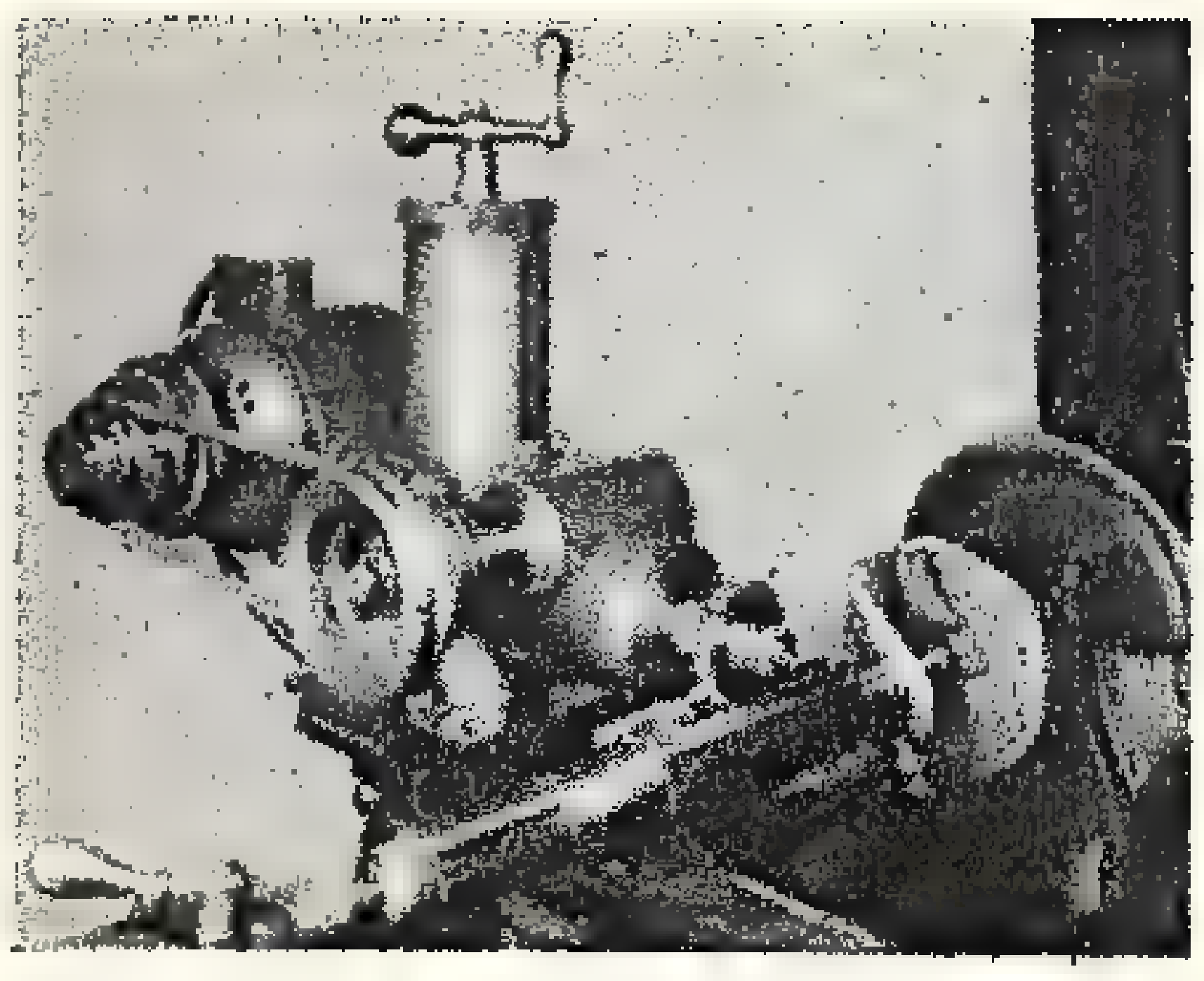
DESIGNED to produce a maximum of power with a minimum of weight, two new types of vibrator-tamping machines have been developed in Germany. They are used for tamping down newly made asphalt or concrete roads and other similar construction work.

The smaller of the two new machines is powered with a small electric motor and is capable of exerting a tamping force of 600 pounds. An electric cable running through the handle of the machine connects the motor with a portable power unit. The larger machine, mounted on a tractor, is powered with a Diesel motor of 100-horsepower. It exerts a tamping force of over 60,000 pounds.

Converter Aids Lathe Work

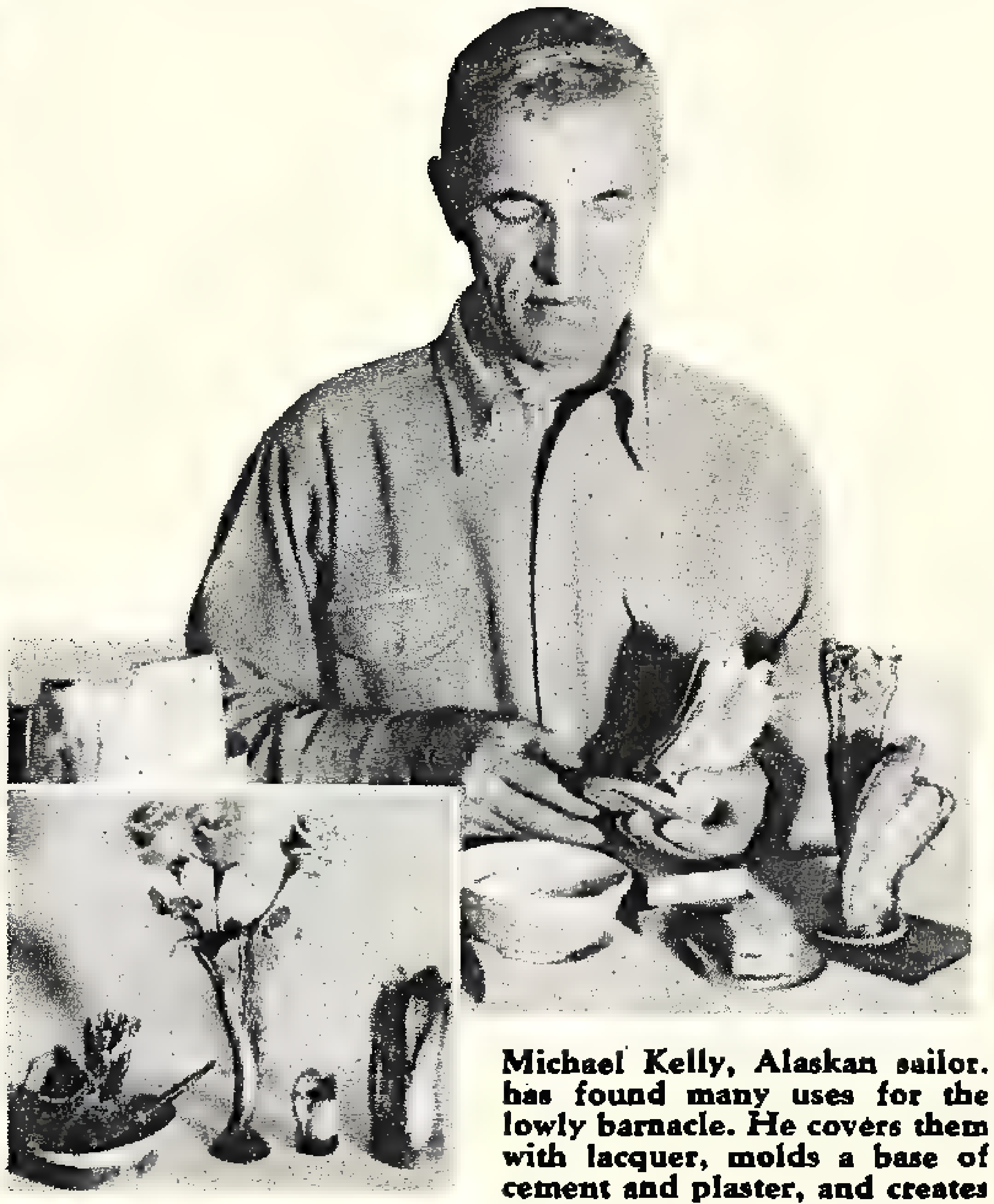
A MASTER lathe converter device that makes it possible, when used in conjunction with an engine lathe, to do practically every conceivable operation of milling, grinding, and broaching, has been invented by a North Kansas City, Mo., manufacturer.

A feature of the new device is that it is not necessary to dismantle the lathe in order to attach it.



This master lathe converter, when used on an engine lathe, enables the operator to use the lathe as a milling, grinding, or broaching machine. It is easily attached.

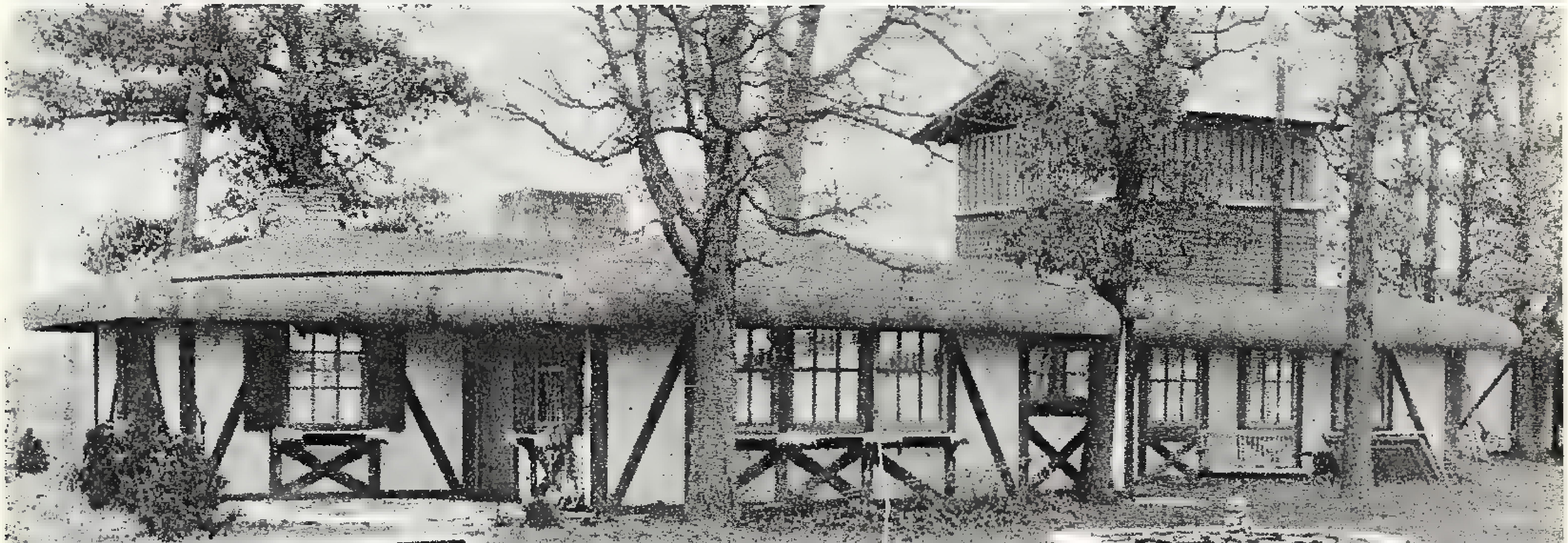
Creates Barnacle Novelties



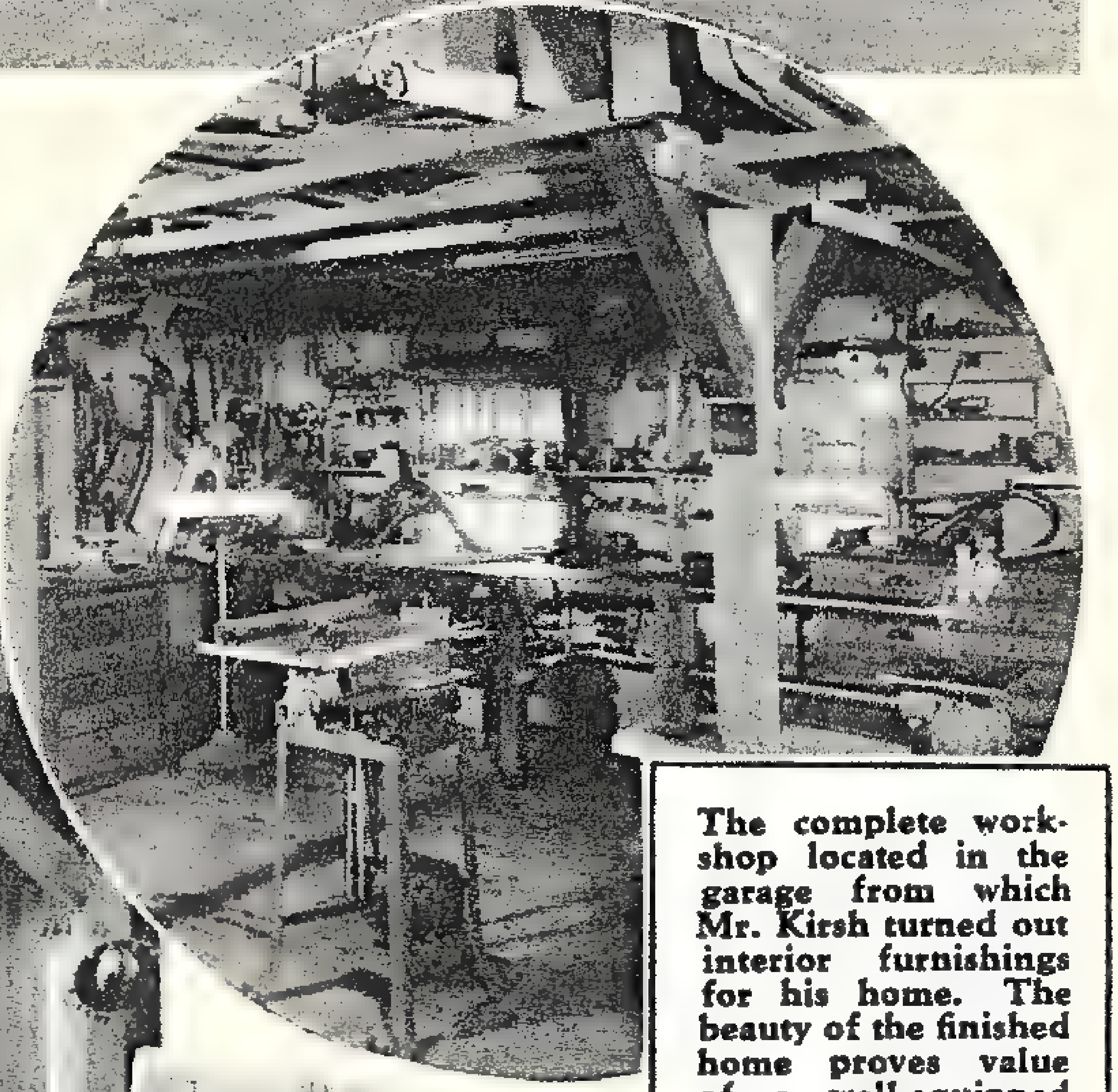
Michael Kelly, Alaskan sailor, has found many uses for the lowly barnacle. He covers them with lacquer, molds a base of cement and plaster, and creates flower vases, ash trays, etc.

FLOWER vases, ash trays, match holders, and many other novel objects have been created from barnacles by Michael Kelly, an Alaskan sailor. The barnacles, ranging in size from 1 to 15 inches, are treated with lacquer to give them a finish. Quick setting cement makes a base for the finished objects.

WORKSHOP FAN BUILDS OWN HOME



Above—This charming stucco-covered home of Swedish design was constructed by one man at Fox Lake, Wisconsin. A pent house tops the combined workshop and garage. Left—Hugh I. Kirsh, vice-president of the Western Malleable Co., built the home in his spare time.



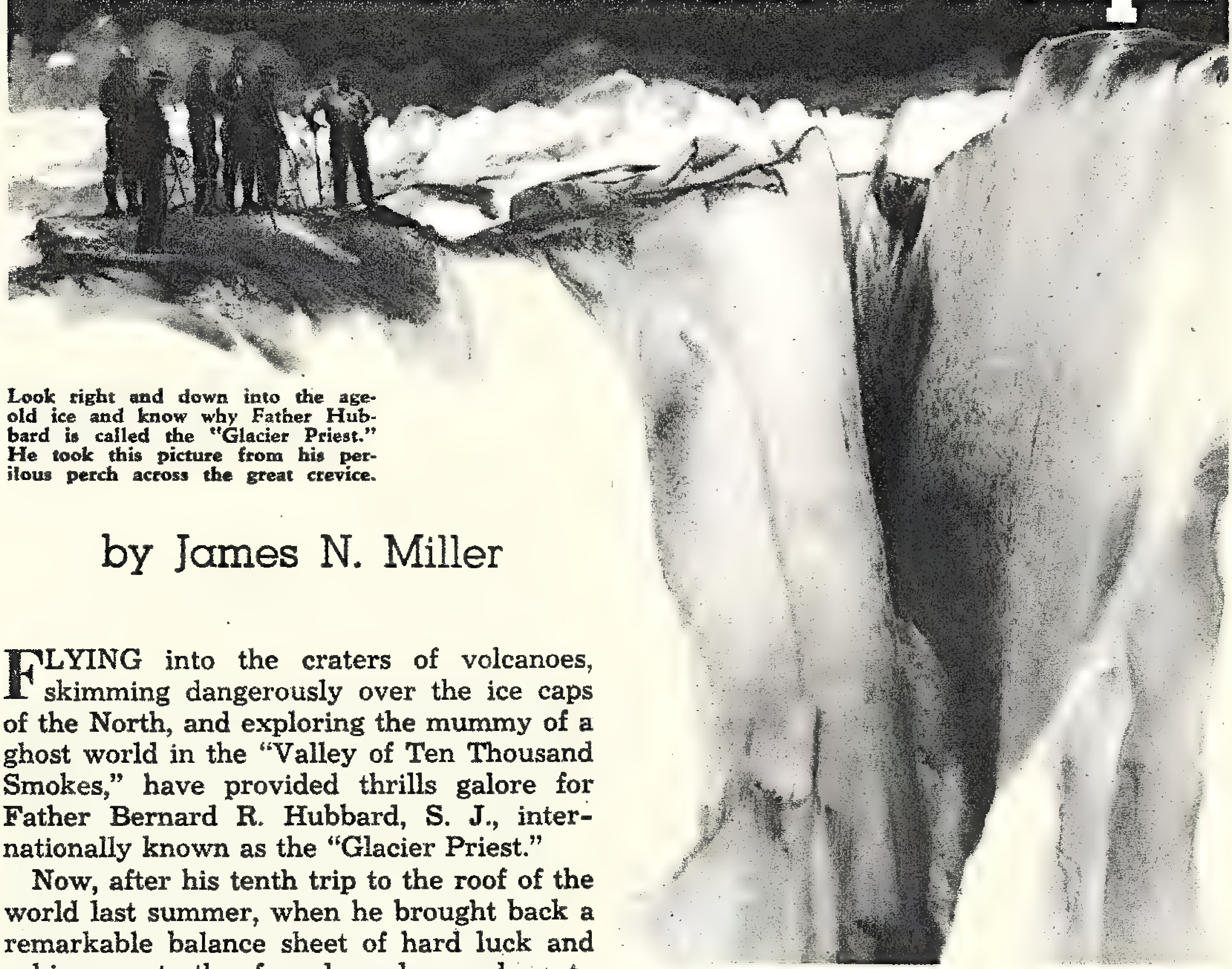
The complete workshop located in the garage from which Mr. Kirsh turned out interior furnishings for his home. The beauty of the finished home proves value of a well-equipped home workshop for the tool-handy man.

Handmade twin poster beds with beaded decorations are a feature of Mr. Kirsh's home. Knotty pine walls add beauty.

HUGH I. KIRSH, of Fox Lake, Wisconsin, built and furnished his own home. Of Swedish design, the home is distinguished by attractive hammered iron work and novel woodworking furnishings. A drooping shingled roof and a gray stone chimney serve to give the home an aspect that fits in well with the surrounding landscaped setting.

The dining alcove of Mr. Kirsh's unique home. Scrolled window frames, open shelves and handtiled decorations beneath the leaded windows create an effect of simple beauty.

GLACIER PRIEST Maps



Look right and down into the age-old ice and know why Father Hubbard is called the "Glacier Priest." He took this picture from his perilous perch across the great crevice.

by James N. Miller

FLYING into the craters of volcanoes, skimming dangerously over the ice caps of the North, and exploring the mummy of a ghost world in the "Valley of Ten Thousand Smokes," have provided thrills galore for Father Bernard R. Hubbard, S. J., internationally known as the "Glacier Priest."

Now, after his tenth trip to the roof of the world last summer, when he brought back a remarkable balance sheet of hard luck and achievement, the famed explorer plans to turn from the study of geology—the science of rocks—to the study of primitive human beings.

For, while pondering the mysteries of the birth of storms that influence the four seasons of the year in the United States for better or for worse, Father Hubbard believes he has also fathomed the origin of man in America, who came to this continent on a newly discovered ancient road from Asia.

Father Hubbard believes that his last trip, the tenth in a successive series, was the most important of all. He found that the Taku ice-cap, near Juneau, one of the southernmost formations of its kind, is receding and exposing a fossil glacier of the last Ice Age. Nearby, he said, the Taku glacier was half aground and will soon cease breaking off icebergs, and Twin glacier has receded a mile and is wholly aground. This means the tremendous flow of icebergs that consitutes an ever-present menace to shipping hundreds of miles to the south, soon will be a hazard of the past.

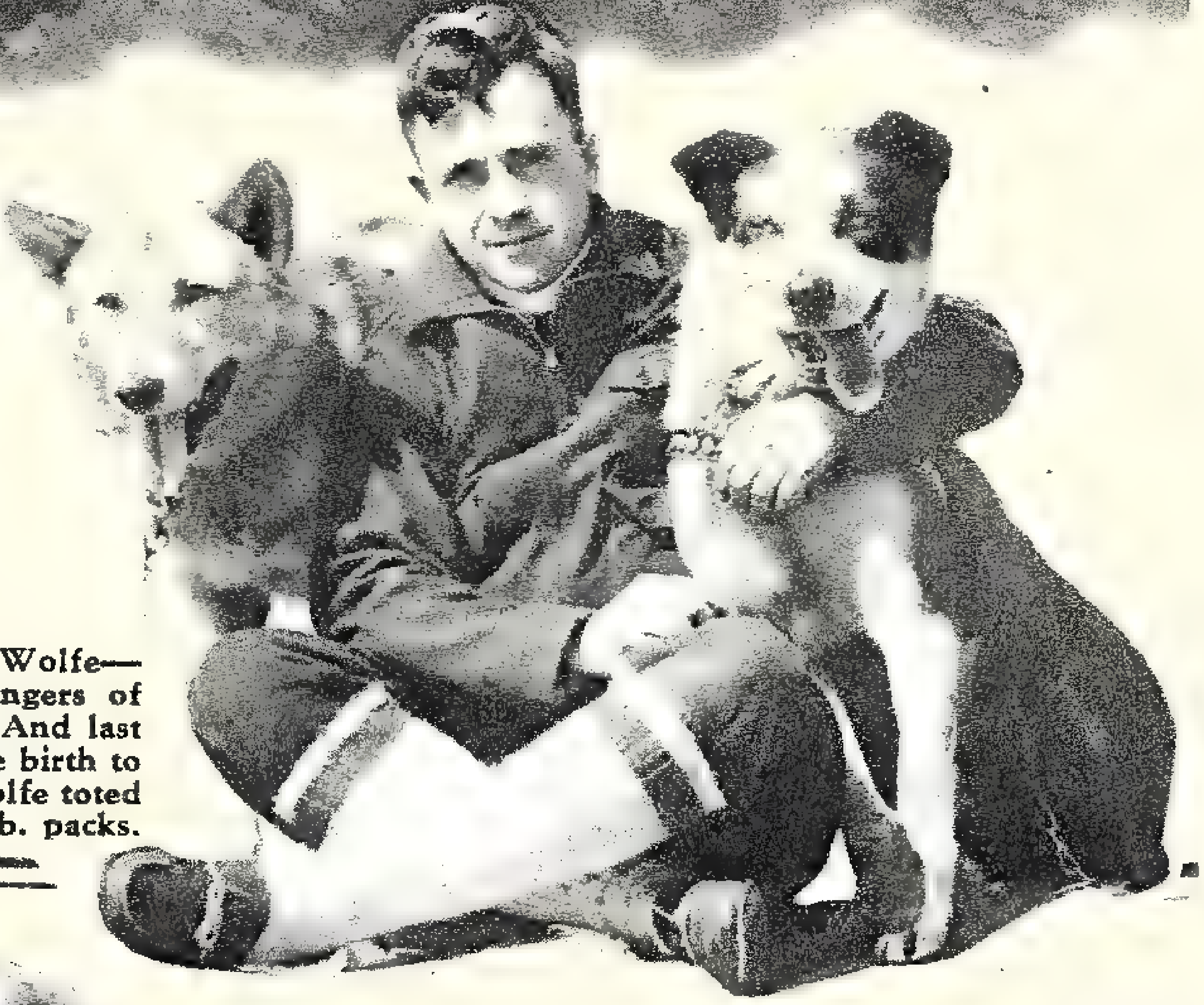
Does this rock writing mark the road by which ancient man first came into America from Asia? Father Hubbard (above) believes so, claiming many came in over this chain of Aleutian Islands, although the main route was by the Bering Sea.

Viewing the immense Taku ice-cap last summer for the first time in ten years, the Glacier Priest reported:

"The vast ice mass is shrinking, which proves that the earth is still in a recessional ice age. On Taku ice-cap many new mountains, called Nuntakas, as well as long, rocky ridges have appeared where I saw only

ROOF of the WORLD

Soaring over craters, jumping bottomless pits edged with rotten ice, frozen by gales, feet frying in volcanic heat—these are experiences of Father B. Hubbard.



Magook, Father Hubbard and Wolfe—the three pals who fought the dangers of six Alaskan expeditions together. And last summer, when a mother huskie gave birth to seven woolly pups, Magook and Wolfe toted the babies in addition to their 50 lb. packs.

Off Bogsolof, Father Hubbard attempted to make a 4-ton sea lion into a movie actor, but was rebuked with angry barks and a lumbering chase that threatened to crush the nearby cameras and scientific apparatus. A full-grown sea lion is no man's friend.

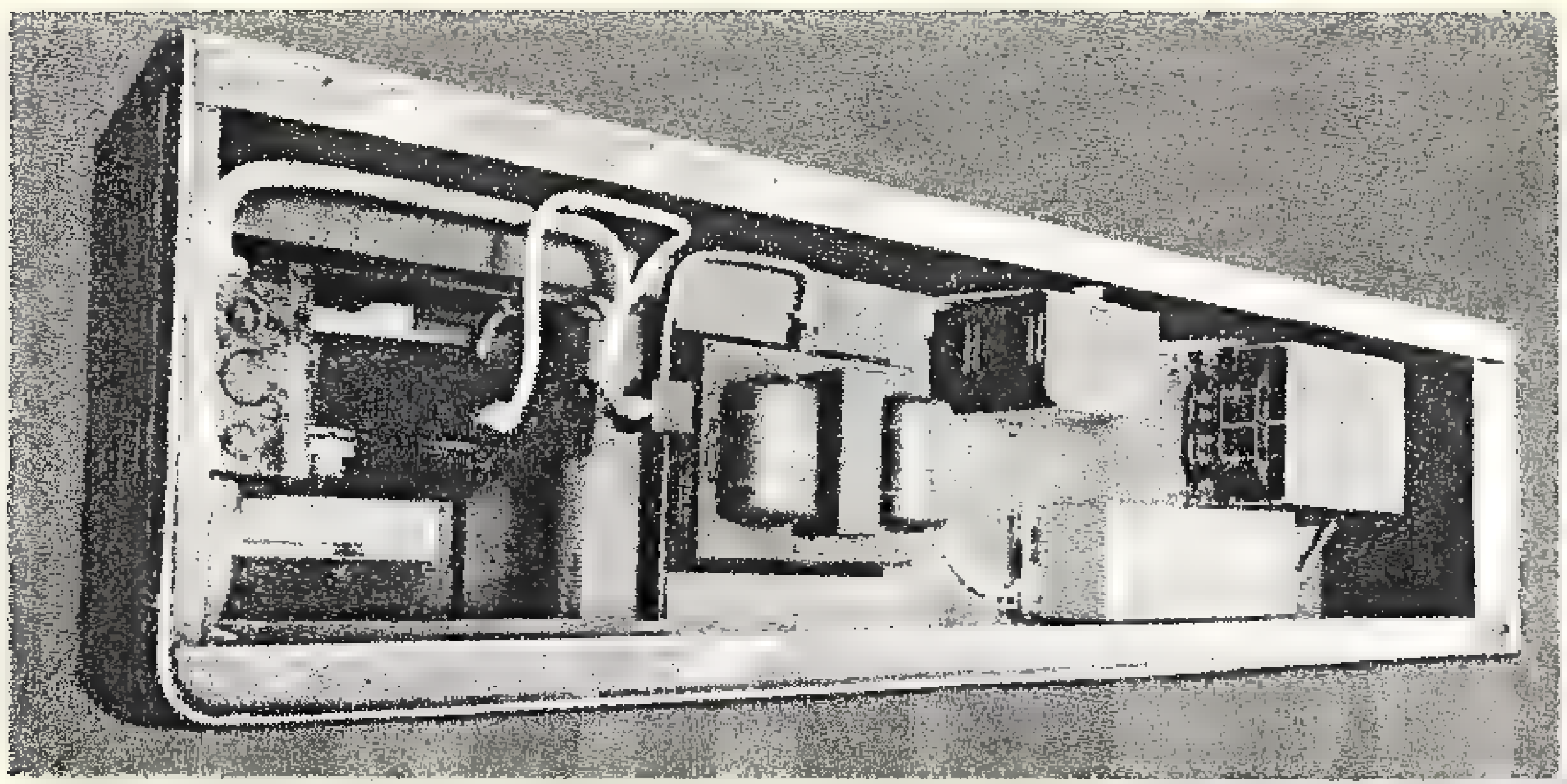
crevassed ice ten years ago, Taku glacier and the lobes of Twin glacier have retreated. The Mendenhall glacier has been melting back and is exposing a fossil glacier underneath the present one. The hundreds of square miles of this ice-cap and its many glacier tongues are a new layer of ice hundreds of feet thick lying on top of a remnant of the last ice age, which is a fossil body of ice entirely different in crystal form. It appears here and there as the upper layer melts."

Father Hubbard and his party found landlocked icebergs in Twin glacier lake, the bottom of which is 600 feet below sea level. The icebergs float there the year round, and keep the water near freezing temperatures.

Nicholas Cavalierre, of New Haven, Conn., a member of the Hubbard party, took 50,000 feet of motion pictures of the Taku region. The year before, on the ninth expedition, the party also took 30,000 feet of film of action "shots" of glaciers of a spectacular type never before filmed—showing enormous mountains of ice tearing away from the glacier mother to strike the sea below with a terrific roar and splash. These "shots" were made on the final 60-mile lap of exploration of the entire 600 miles of the Alaskan Peninsula and adjacent islands, and were taken from a small steamer anchored alongside Hubbard glacier in Disenchantment bay, southeastern Alaska.

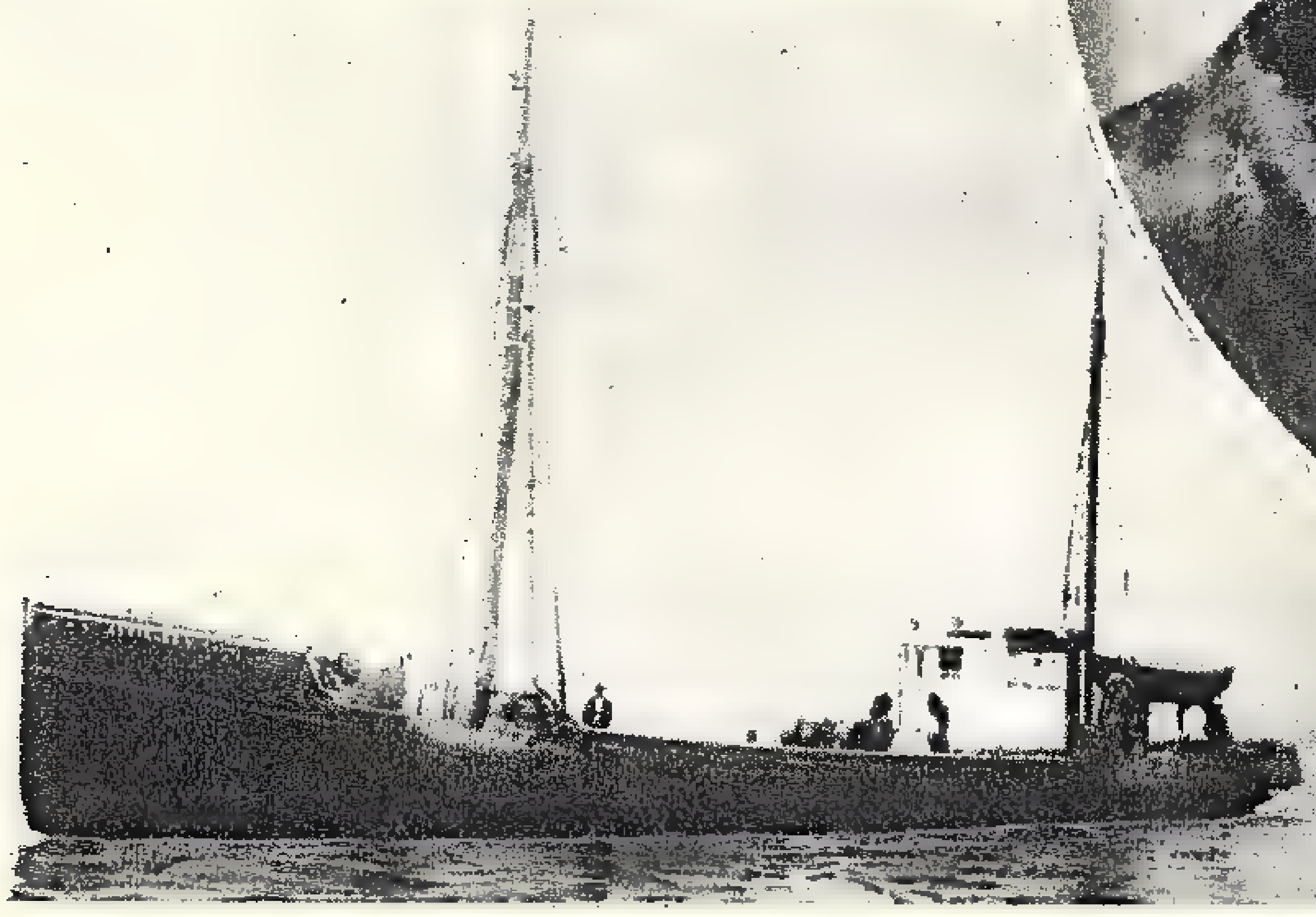
[*Continued on page* 128]

HARBOR TUGS TELEPHONE SHORE

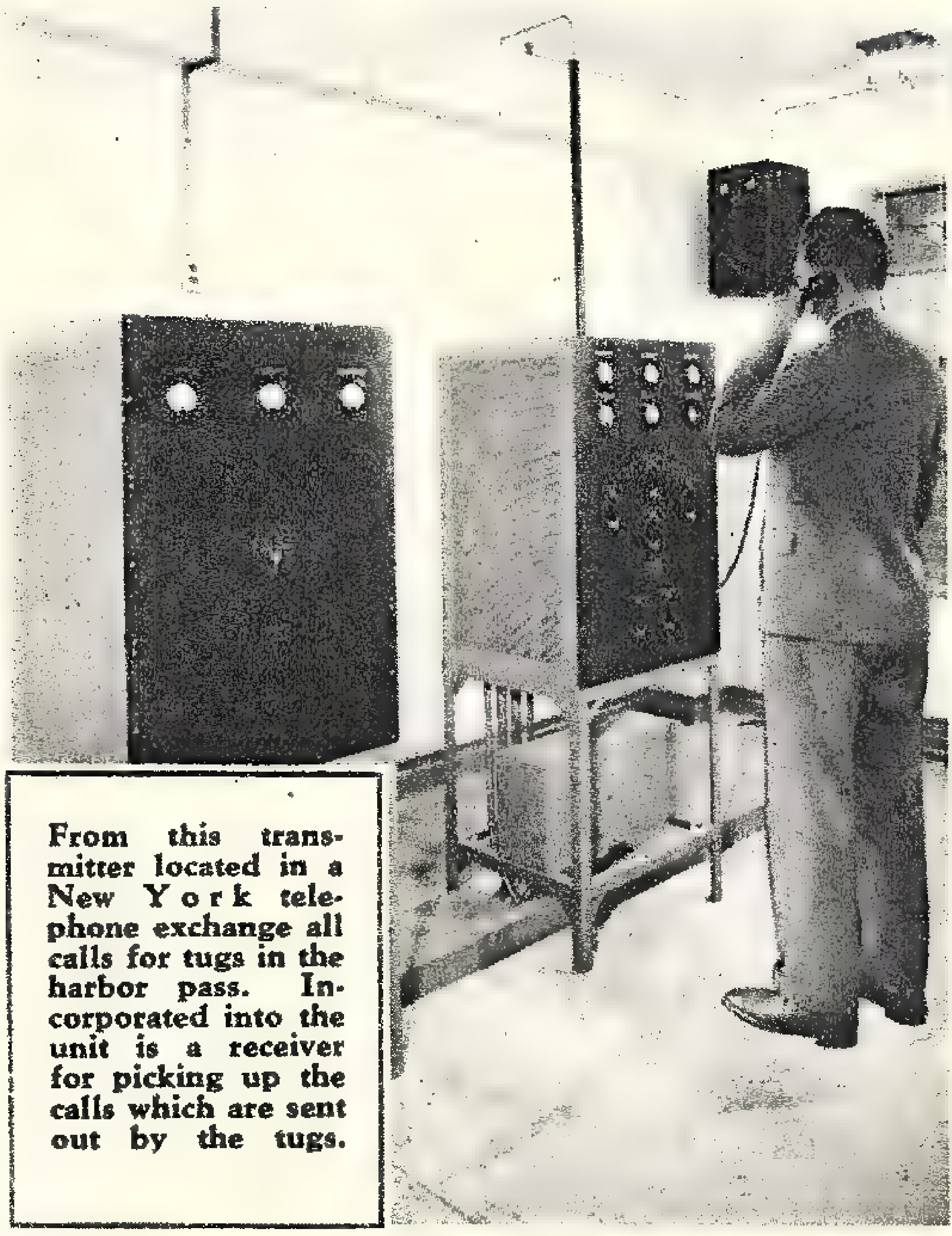


This harbor telephone system can be installed in a closet or under a bunk. It consists of transmitter, receiver and generator plant.

New England fishermen were the first to benefit from the radio-marine telephone. This fisherman is making a call on the older speaker monitor phone. Capt. Ole Whalen, shown below, calls his office on the new selective signaling equipment.



When the *Gertrude M. Fauci,* shown here, sprung a leak in the height of a wintry gale Capt. Patrick McHugh sent his men to the pumps and put through a rescue phone call.



From this transmitter located in a New York telephone exchange all calls for tugs in the harbor pass. Incorporated into the unit is a receiver for picking up the calls which are sent out by the tugs.

INTRODUCED a little more than a year ago as a means of keeping New England fishing vessels in contact with their ports the radio-marine telephone is now an important part of New York's harbor communications system. Until recently tug boats working in the harbor had to watch for wig-wag signals from the shore or else put in to shore and call their office by telephone for further orders.

Due to its success in the New England area a radio-marine telephone system was decided upon for New York harbor traffic. A special exchange has been installed to handle all calls from craft in the nearby waters. A short-wave transmitter sends phone messages out to special receiving apparatus on the tugs.

Bureau Of Mines Opens First Hydrogenation Plant

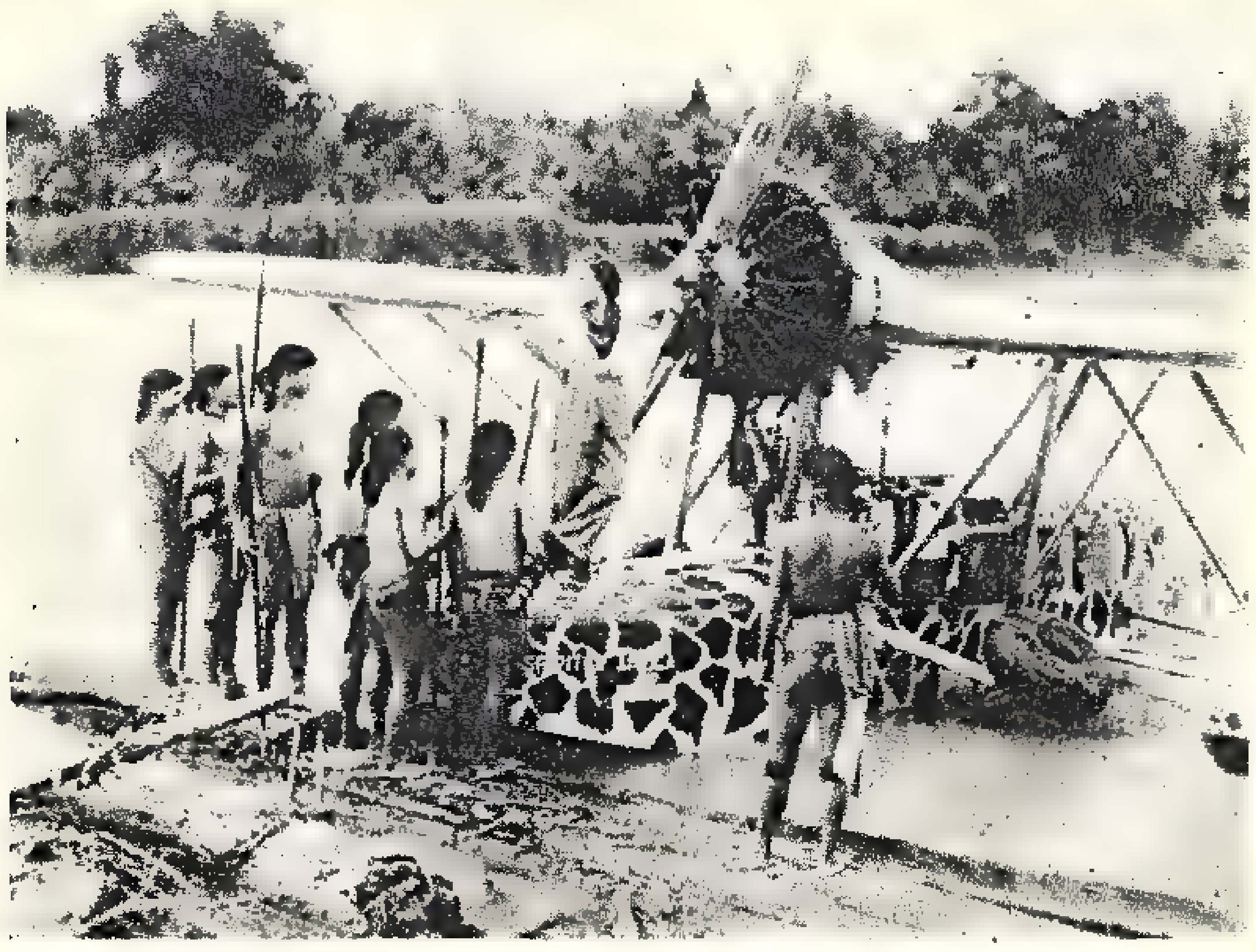
LOOKING ahead to the day in the future when the oil supply of the nation may be depleted, the U. S. Bureau of Mines has opened the first hydrogenation plant in America at Pittsburgh, Pa. In the heart of the coal and oil district, the plant will be used to conduct experiments for making oil from coal. It is estimated that the coal supply of the U. S., unlike the decidedly limited oil supply, will last for 150 years or more.

Coal hydrogenation consists of adding hydrogen to coal and turning the coal into petroleum from which is obtained the by-products—gasoline, kerosene, etc. The process was invented by Dr. Friedrich Bergius, German Nobel Prize winner in chemistry.

Dr. A. C. Fieldner, chief of the Bureau of Mines technologic division, and Dr. H. H. Storch, physical chemist of the bureau, will direct the plant's activities.

Top—First American hydrogenation plant erected at Pittsburgh, Pa., will enable U. S. Bureau of Mines to derive oil from coal. Lower Left—Plant apparatus. Lower Right—Dr. Friedrich Burgius, German chemist who invented the process.

Explorers Use Amphibian

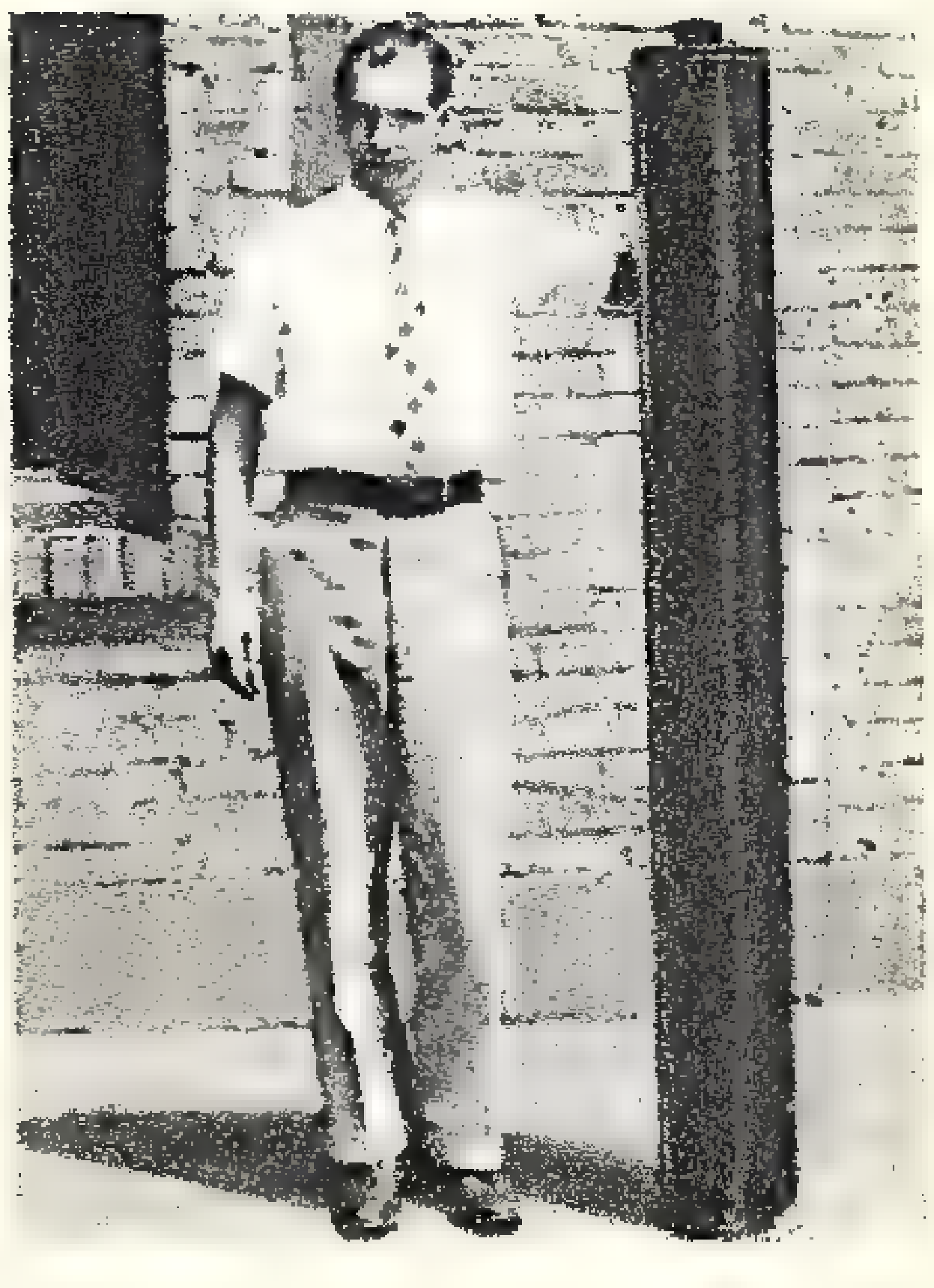


Standing on the bow of her amphibian plane, Mrs. Martin Johnson, famous explorer, invited these Borneo natives to fly. Awed at first, they soon enjoyed the sensation of flight.

AIDED by an amphibian plane based at their jungle camp on the Kinabatangan River in Borneo, Mr. and Mrs. Martin Johnson, noted explorers, are making sound pictures of wild life for the American Museum of Natural History. The plane, used by the Johnsons on their African expedition, too, is named "The Spirit of Africa and Borneo."

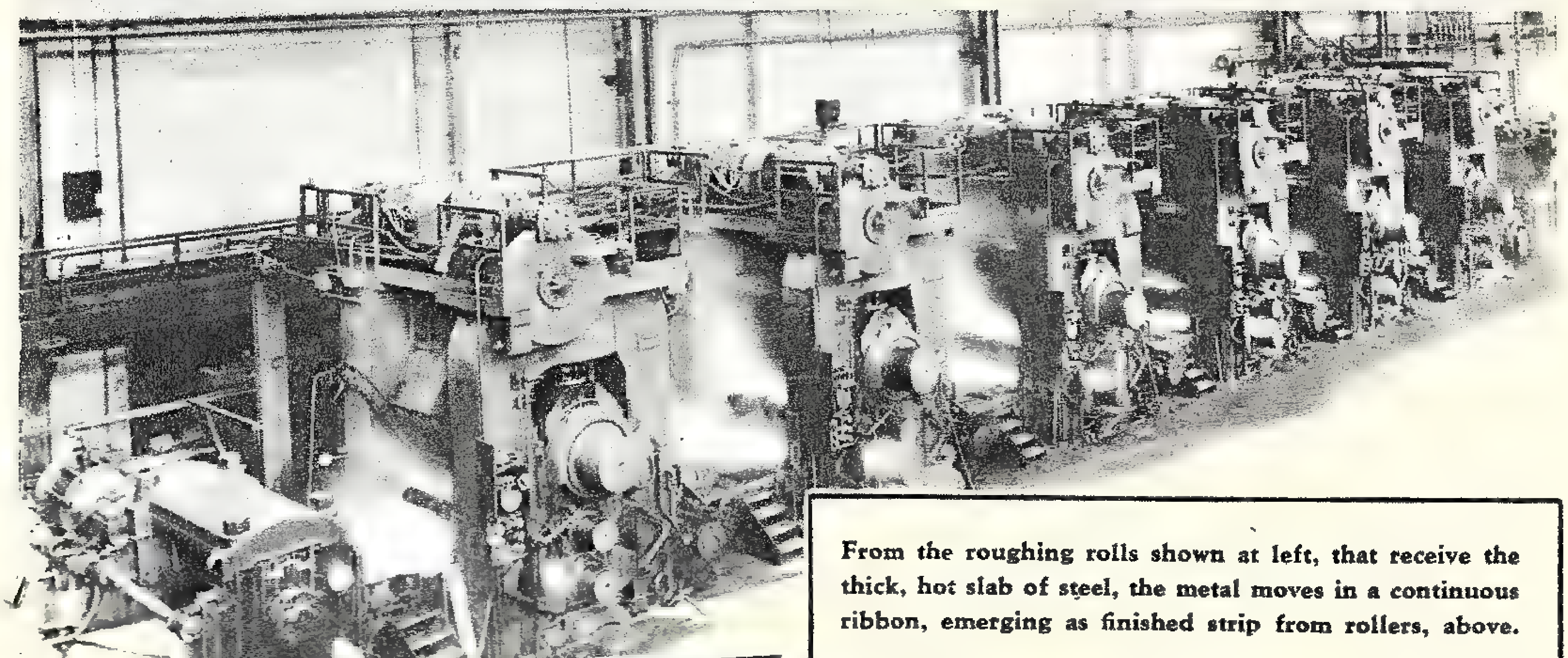
Dry Battery Provides Power

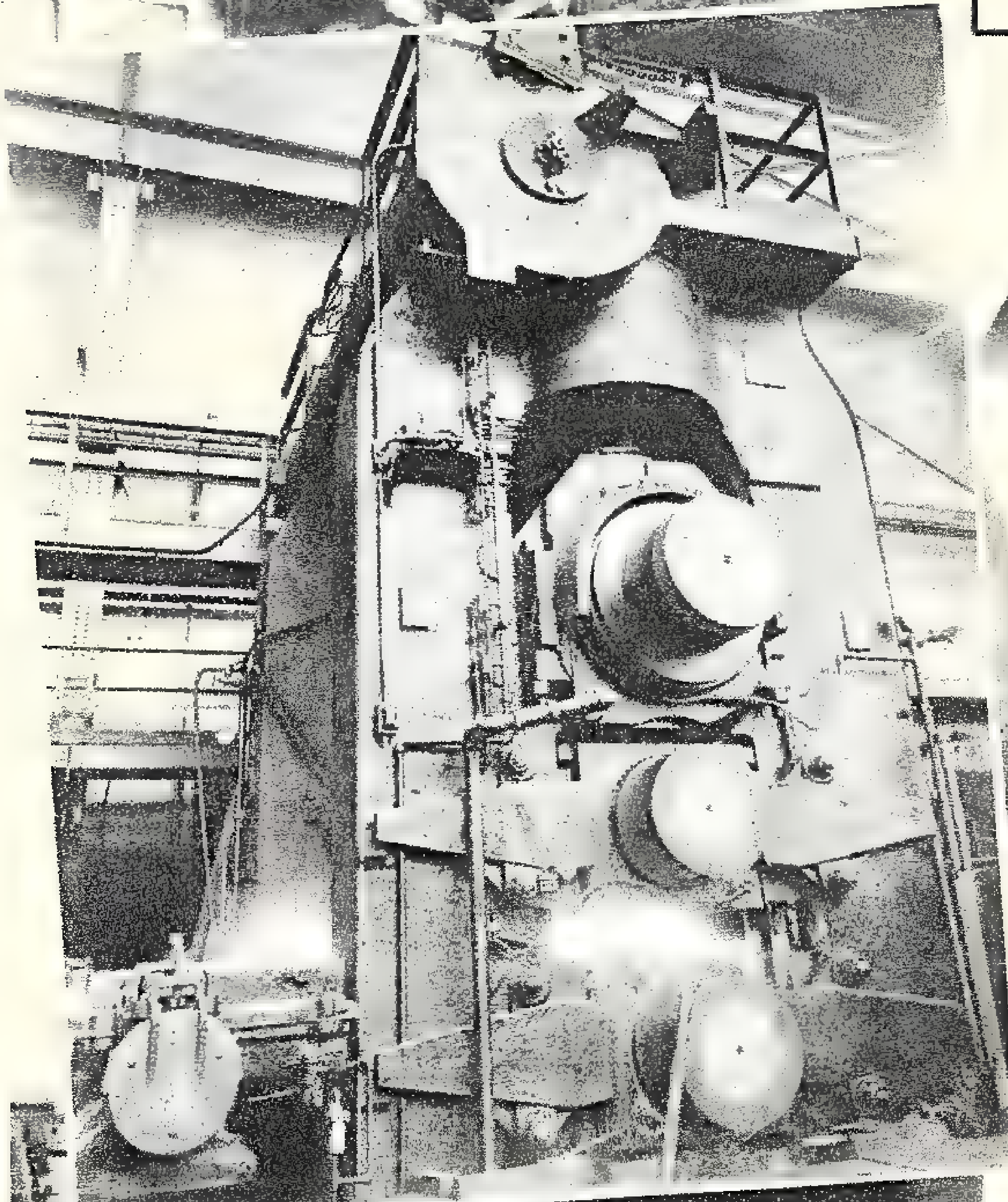
STANDING 6 feet high, the largest dry battery in the world is installed in a flashing inland waterway beacon at St. Louis, Mo. Manufactured by the Ray-Vac Electric Co., Madison, Wis., its 70 cells will provide 6½-volt power for one year.



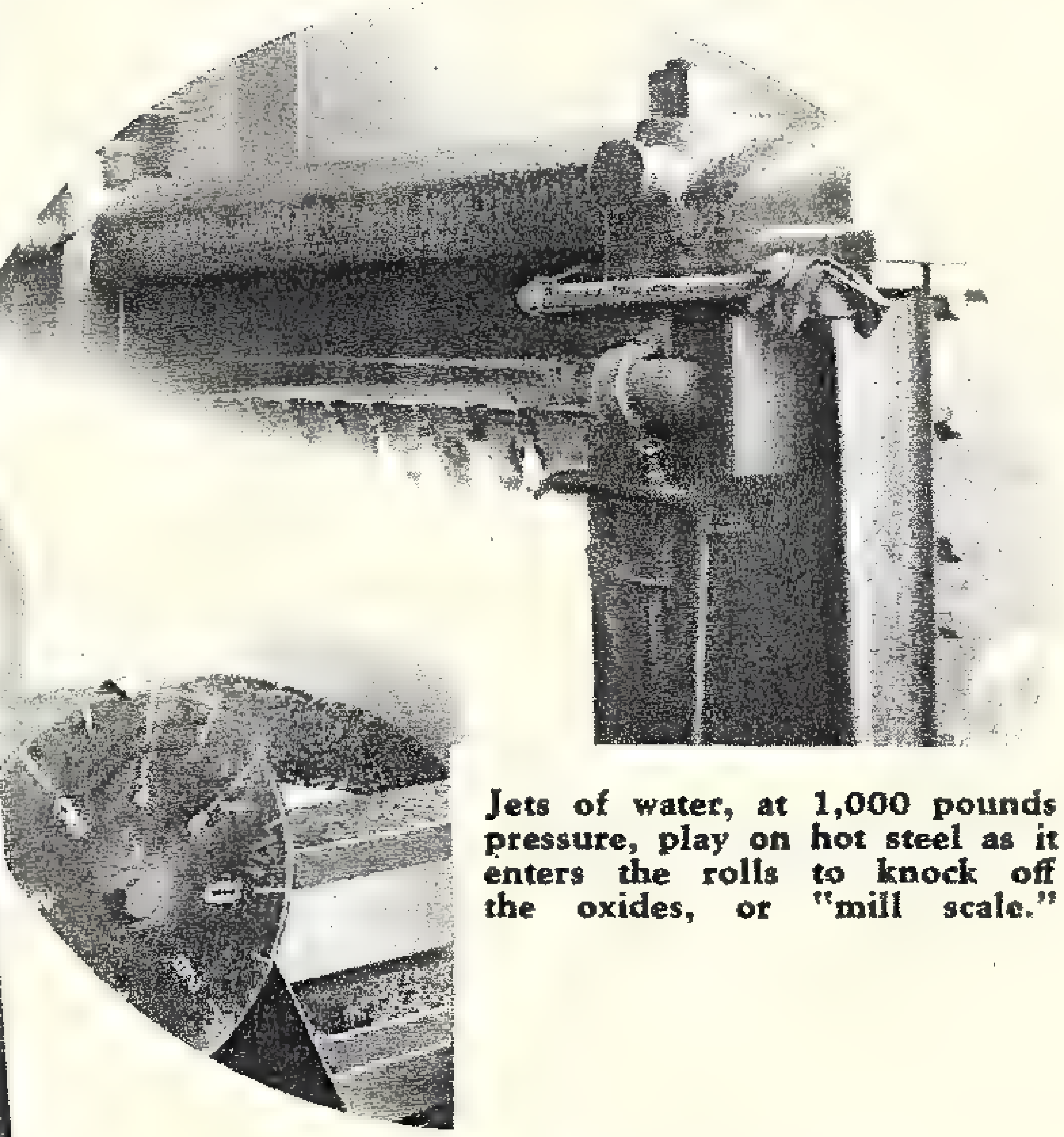
This 70-cell dry battery, 6 feet high, supplies power for one year.

BETHLEHEM Opens New





From the roughing rolls shown at left, that receive the thick, hot slab of steel, the metal moves in a continuous ribbon, emerging as finished strip from rollers, above.



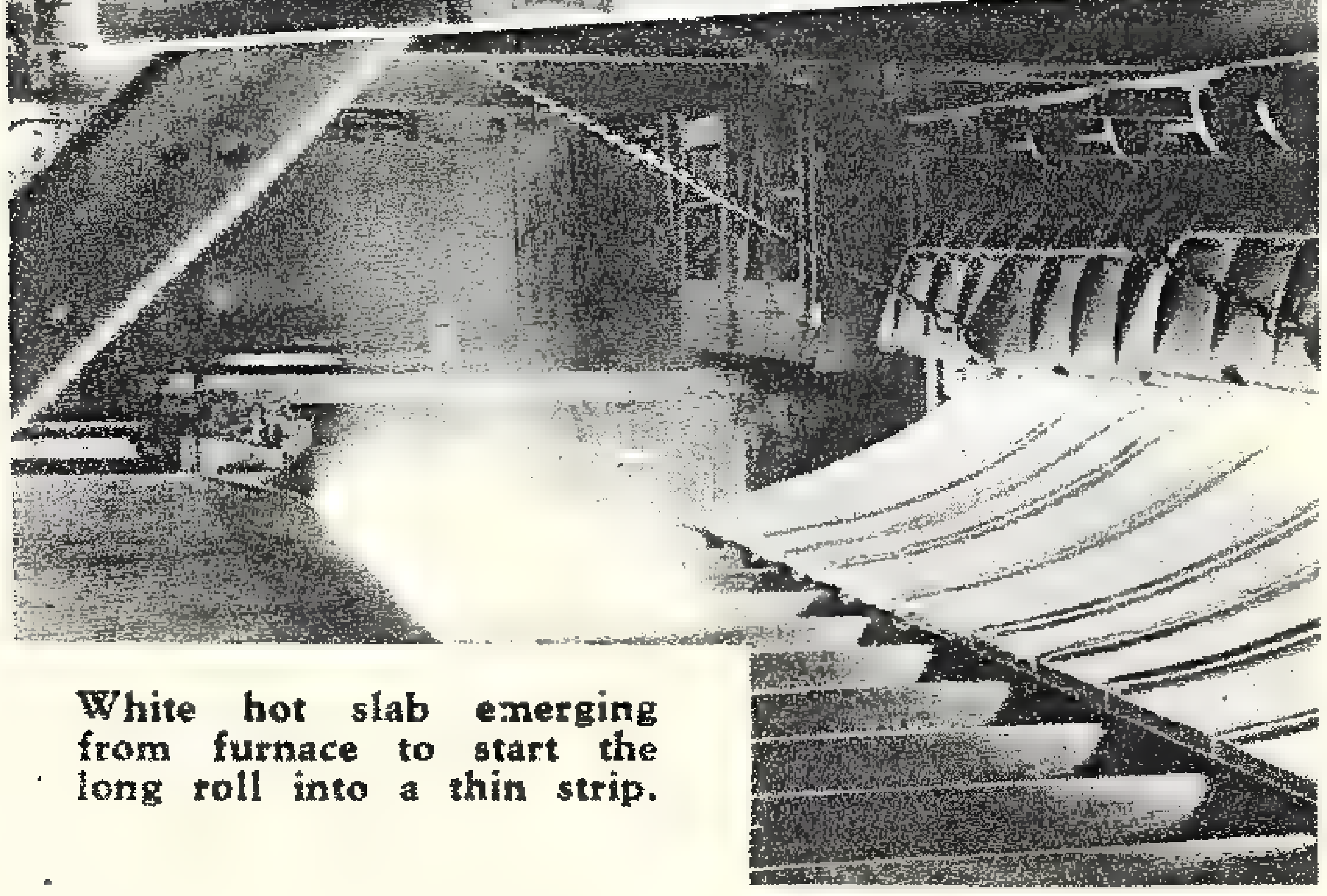
Jets of water, at 1,000 pounds pressure, play on hot steel as it enters the rolls to knock off the oxides, or "mill scale."

by Watson Davis

MAN and machine reach new heights of co-ordination in a new $20,000,000 steel strip mill of the Bethlehem Steel Co., at Lackawanna, N. Y., near Buffalo. Human brains and skill, both in design and operation, combine with precise and delicate control of large electrical power to roll a thick slab into a lengthy strip of sheet metal in a few minutes.

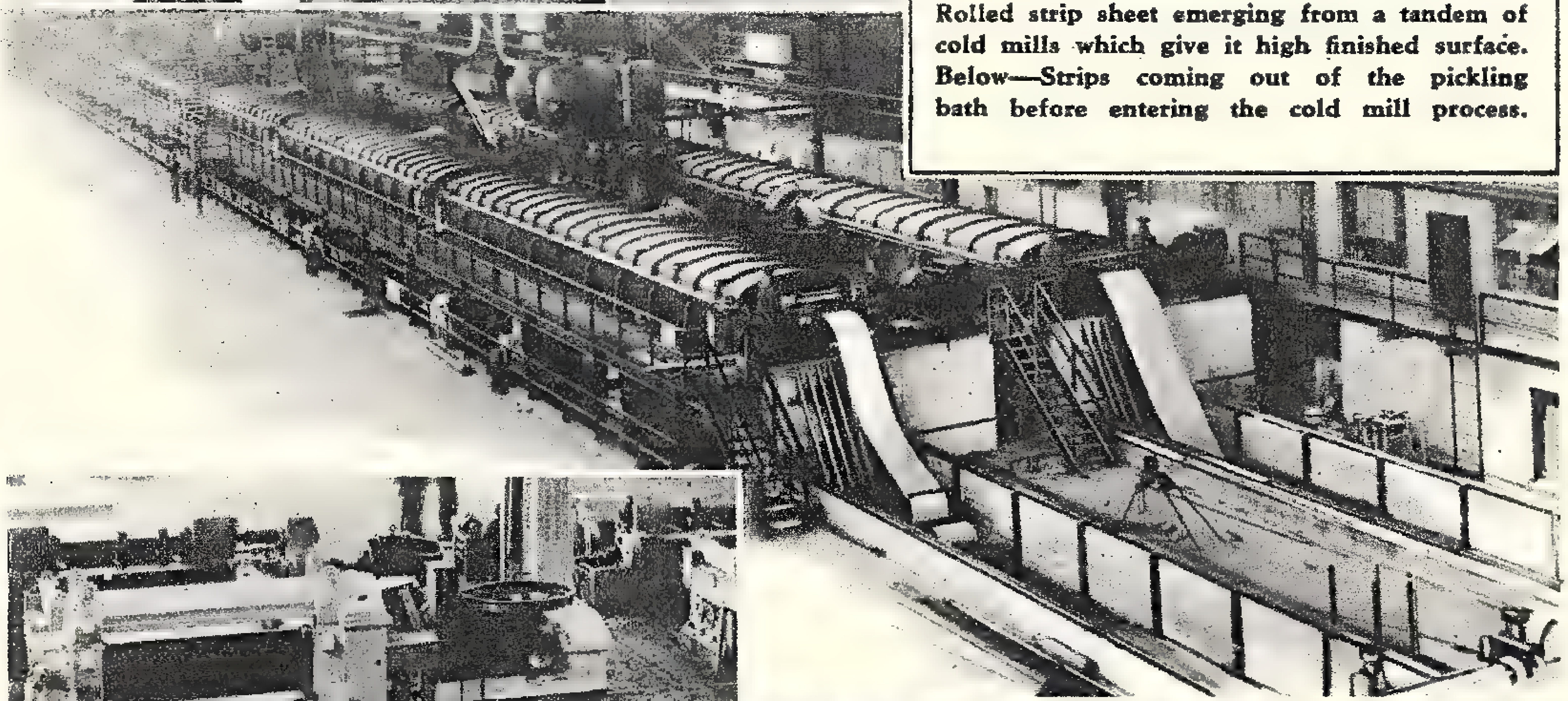
To see a red-hot chunk of steel pass successively through eleven huge sets

[Continued on page 128]

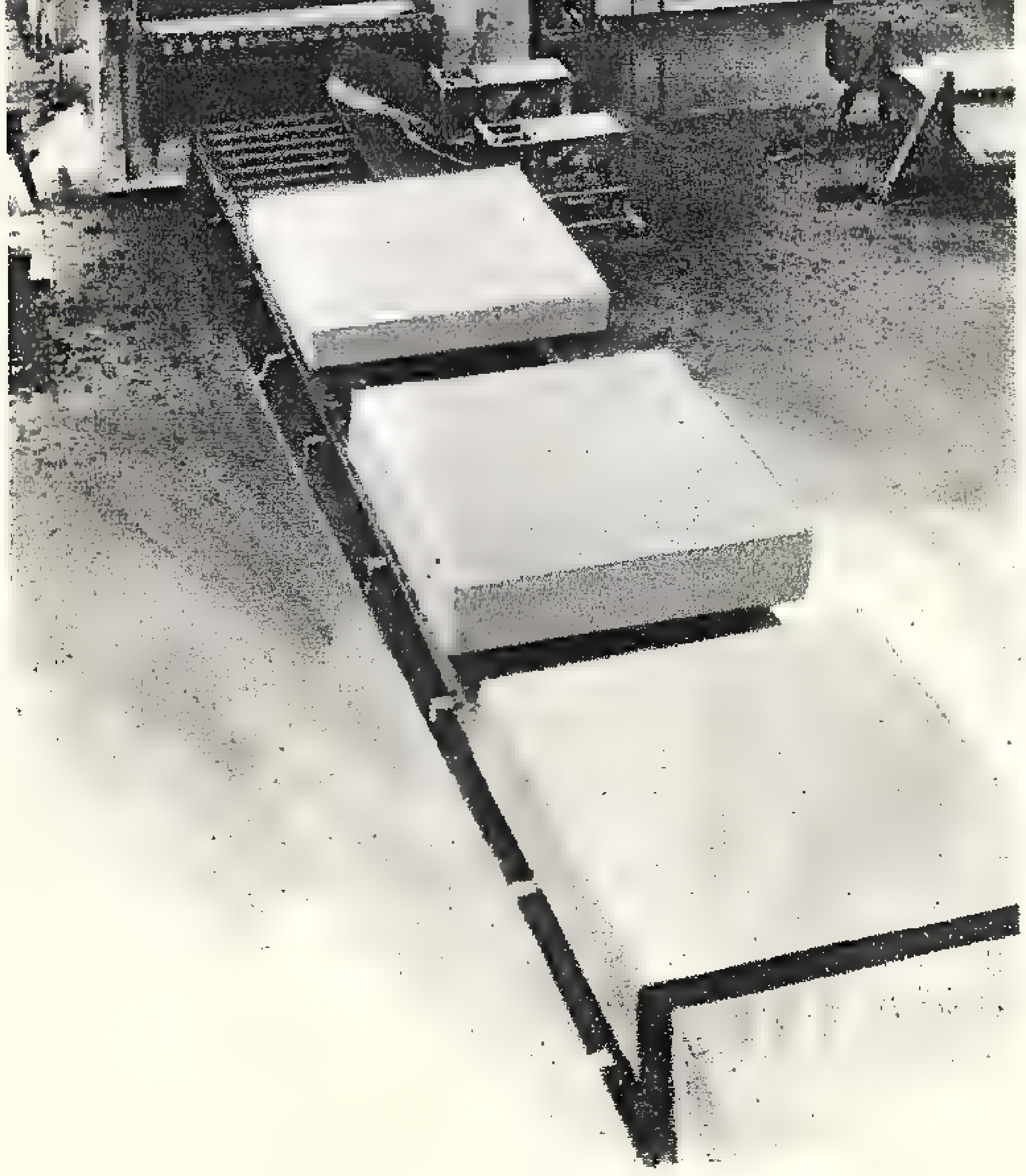


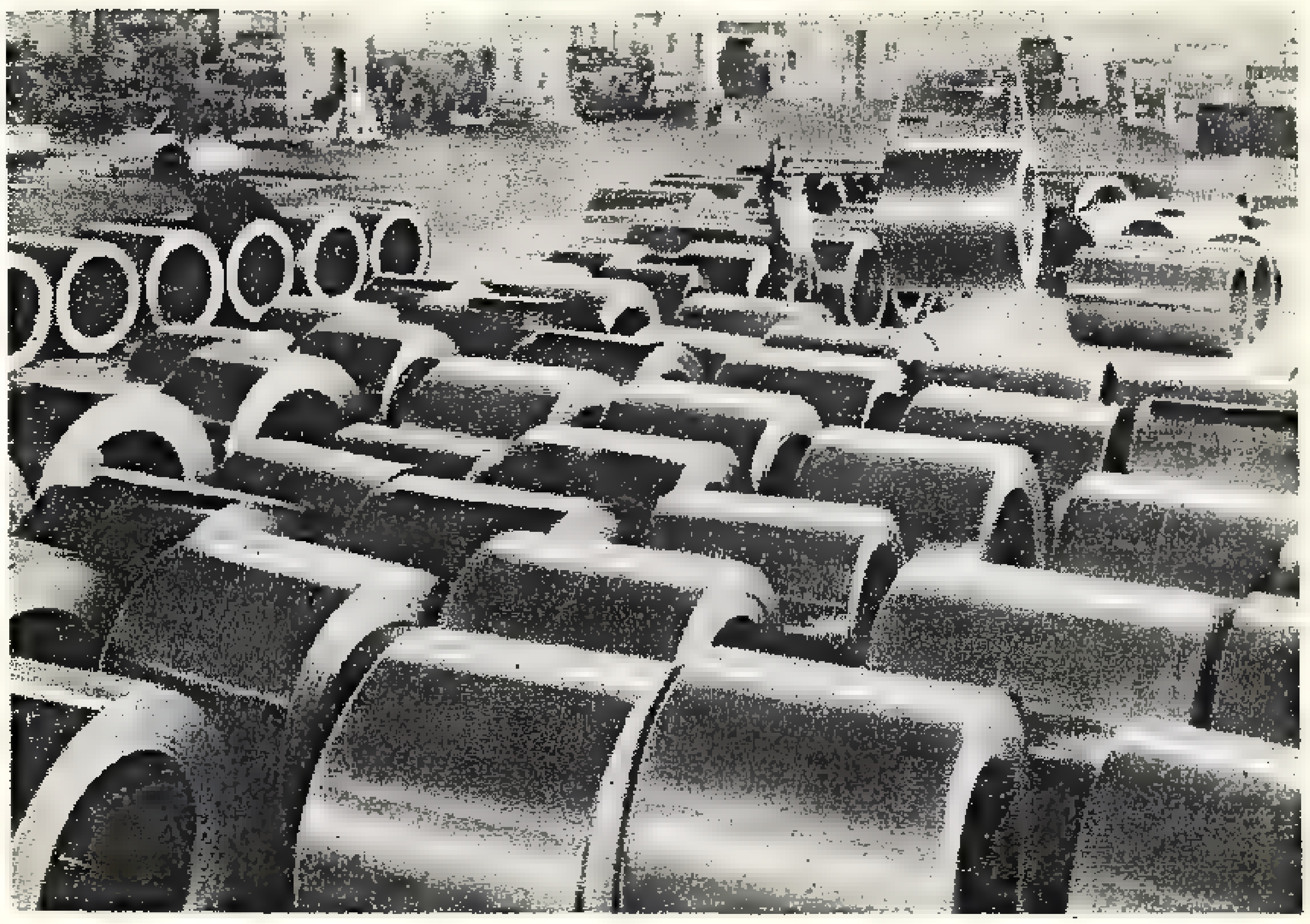
White hot slab emerging from furnace to start the long roll into a thin strip.

$20,000,000 MILL



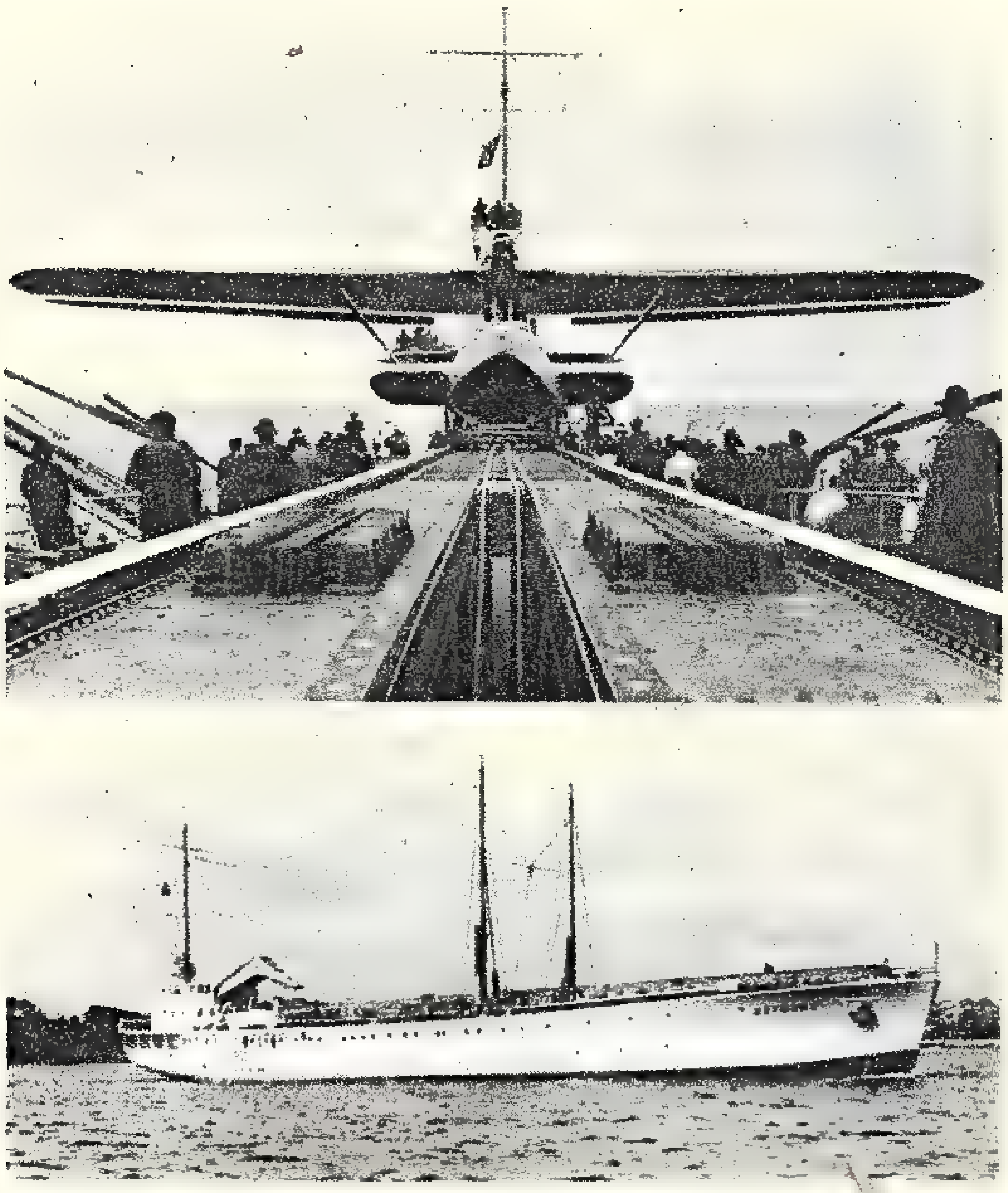
Rolled strip sheet emerging from a tandem of cold mills which give it high finished surface. Below—Strips coming out of the pickling bath before entering the cold mill process.





The finished product ready for cold-forming into auto bodies and hundred-and-one other products. It is shipped in flat sheets, as at left, and in coils weighing tons each.

Floating Aerodromes Speed Trans-Ocean Flights



With improved air service between South America and South Africa it was found necessary to construct this second floating aerodrome, the "Ostmark." Planes are catapulted from deck.

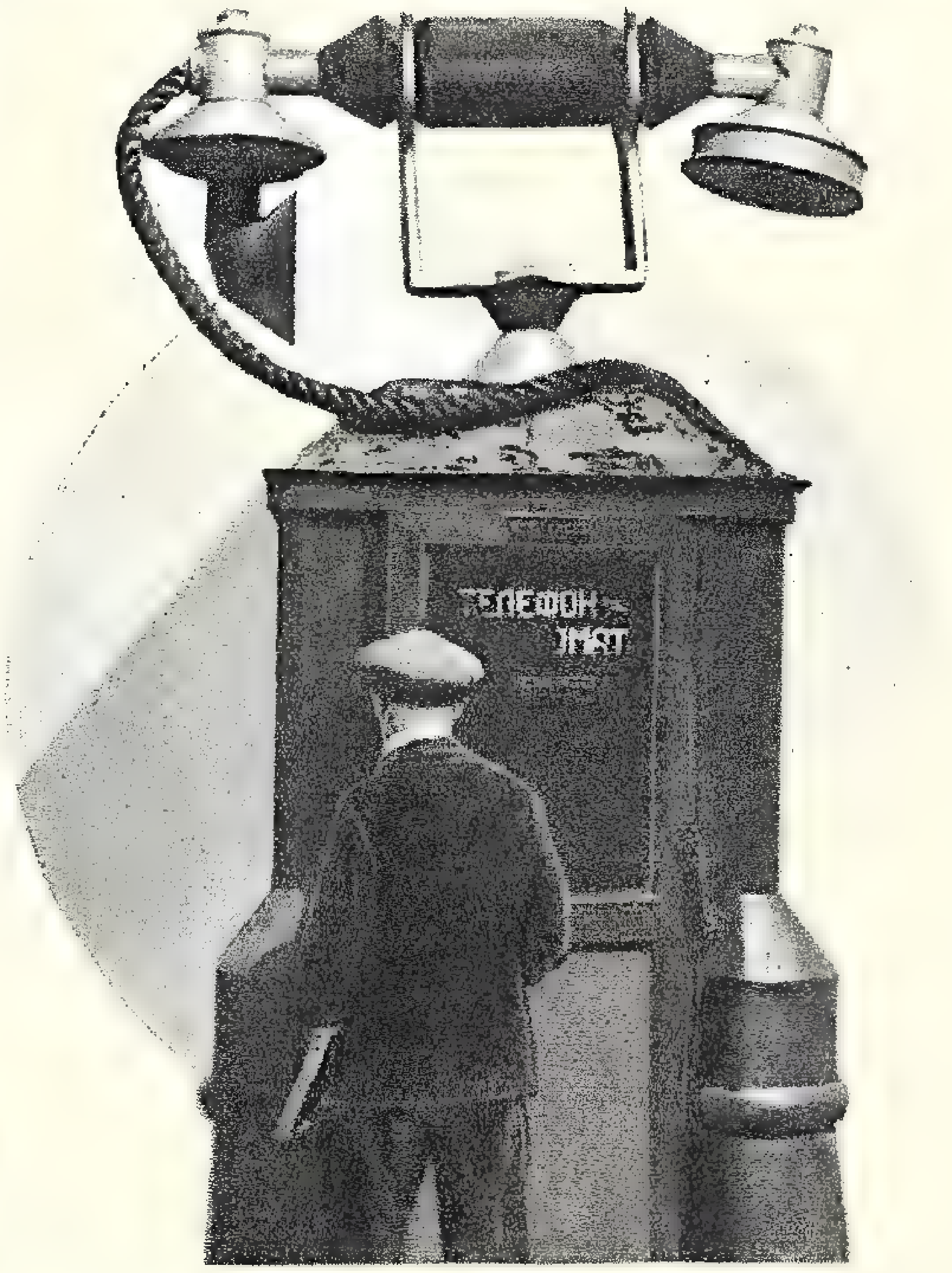
WITH the construction of a new fleet of planes for the South Africa-South America service, at the Dornier Works in Germany, the service has been improved to such an extent that a new sea aerodrome has been placed in service near the South American coast. Christened the "Ostmark," the craft is equipped with complete radio apparatus for sending weather reports to the planes in flight. In landing the express planes light on the water and are lifted to the "Ostmark's" deck by a huge crane. After being refueled the planes are placed on a hydraulic catapult and "shot" into flight to continue on their way. Three aerodromes are employed for this ocean air service since one ship must always be undergoing dry dock repairs.

Grandfather Wins Air Race

AN AIR meet recently staged at Bradford, Pa., featured only flyers who were grandfathers. The race, which was over a 25-mile course, was won by 62-year-old Paul Lyon who narrowly scored over Harold Sherrick, a youngster of 49; the grandfather of six children. The air meet was sponsored by the recently organized "Flying Grandfathers Association" with headquarters at Bradford. Among the entries was 71-year-old George Metzger of Emporium, Pa., who handled his plane like a youthful pilot.

Winner of what is believed to be the first grandfathers' air race is Paul Lyon, who is shown here with his wife, daughter and grandson. Race was staged over a twenty-five-mile course.

Russia Builds Phone Booths



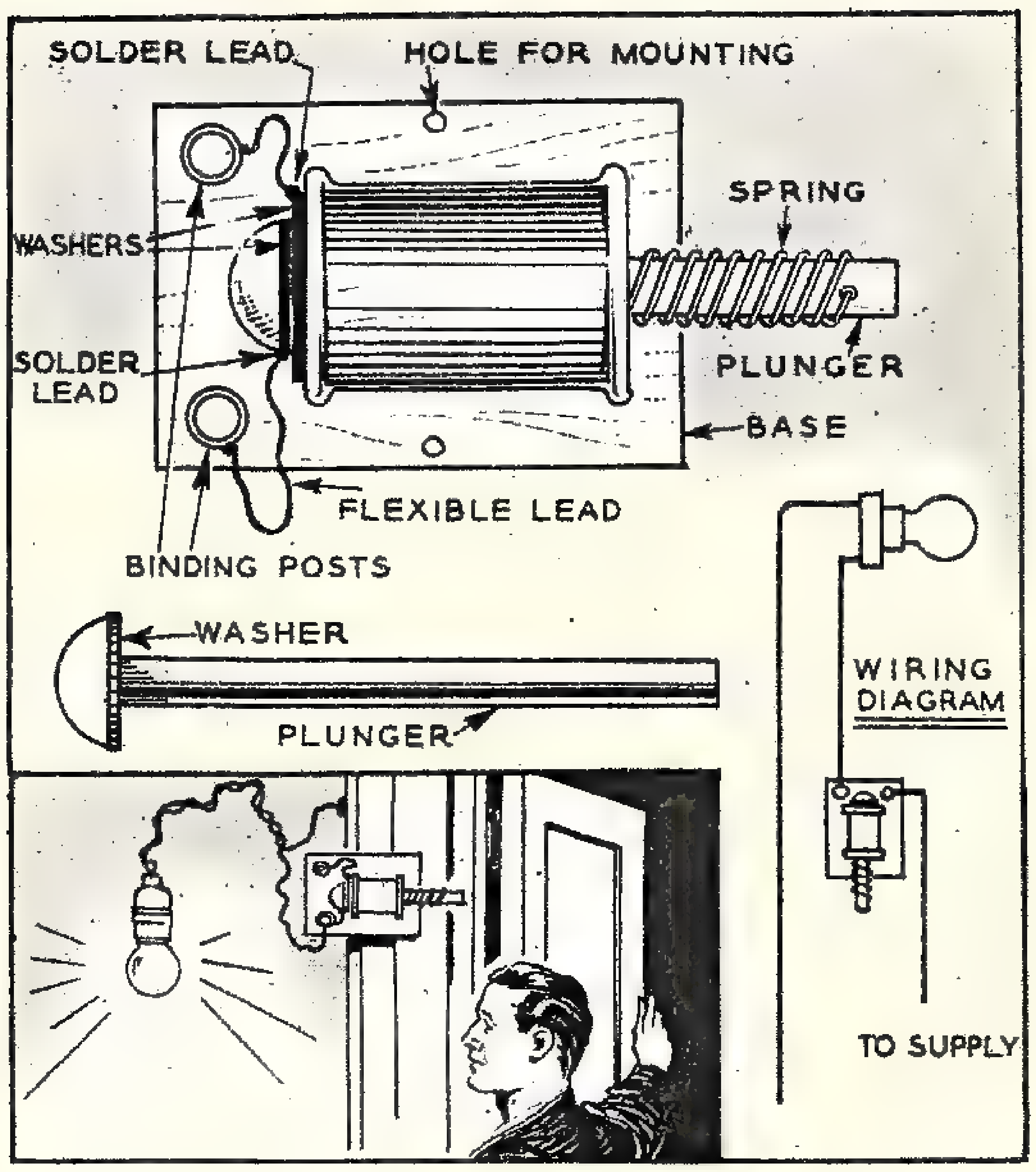
Telephone pay stations aren't difficult to locate in Russia. Giant hand sets like this one have been erected on the roofs of phone booths to popularize service. Phones are of sheet metal.

IN ORDER to popularize telephone service in that country the Russian government has placed public telephone booths on the streets of all large cities. In order that they would attract the public's eye, large hand phones were made from sheet metal and erected on the roofs of the pay stations.

RADIO SPARKS and ELECTRICAL EXPERIMENTS

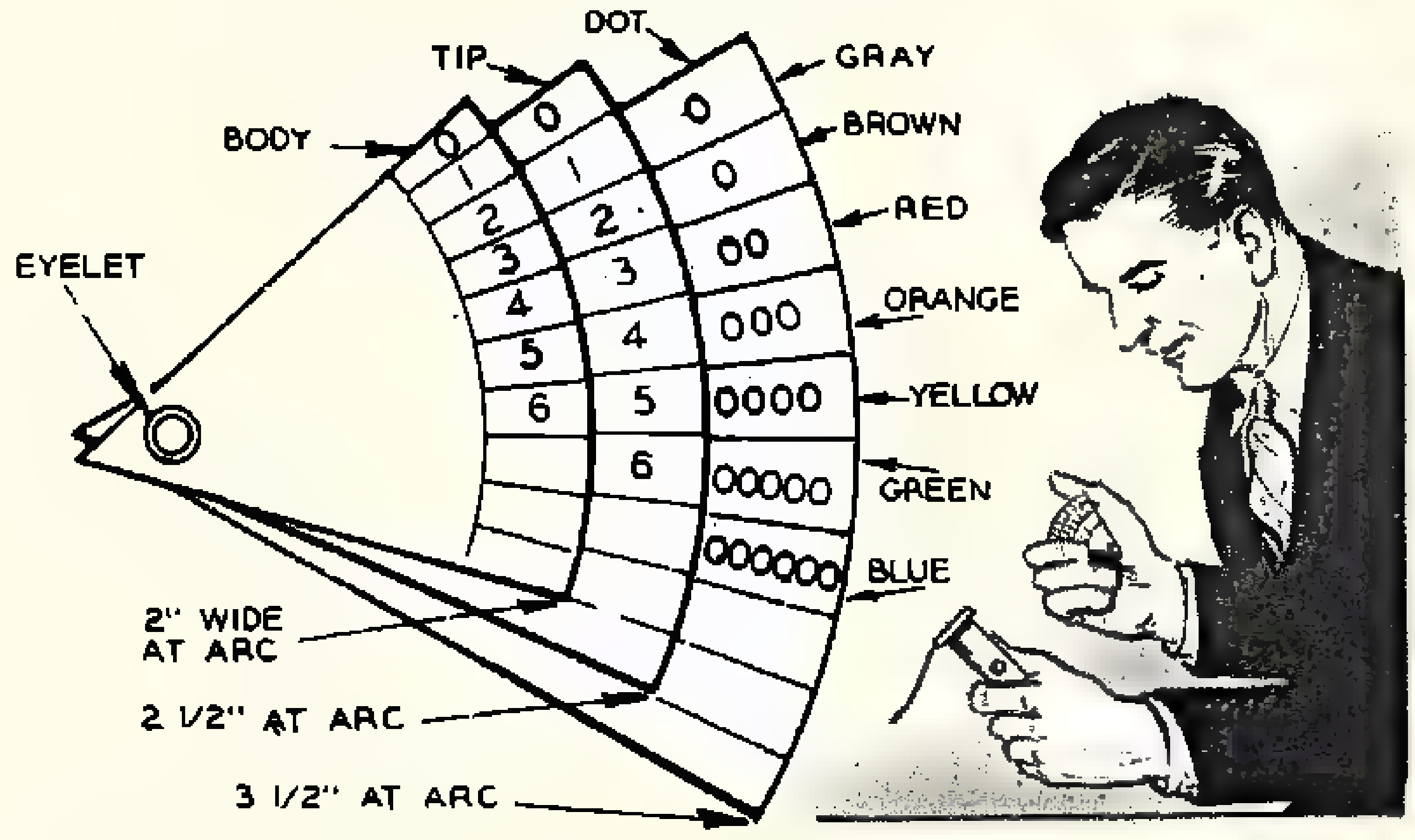
Spool Is Automatic Switch

A SWITCH that will automatically turn on the lights in a closet when the door is opened can be made from a cotton thread spool and a few other parts which are certain to be found about the home. Mount the spool on a block of wood. To one end of the spool cement a large brass washer and connect it to a terminal post with a length of wire. Secure a wooden dowel rod just large enough to slide inside the spool and force a slightly smaller brass washer over one end. Solder a length of flexible wire to this washer and connect it to the remaining binding post. Drill a hole in the opposite end of the wooden dowel so that the end of a wire spring may be inserted and locked in place. Insert switch in light circuit.


SOLDER LEAD
HOLE FOR MOUNTING
SPRING
WASHERS
SOLDER LEAD
PLUNGER
BASE
FLEXIBLE LEAD
BINDING POSTS
WASHER
PLUNGER
WIRING DIAGRAM
TO SUPPLY

With this automatic closet switch installed just inside the door it is no longer necessary to fumble in the dark for switches. Spool, brass washers, spring and wood dowel comprise parts.

Chart Identifies Resistors


DOT
TIP
GRAY
BODY
BROWN
RED
EYELET
ORANGE
YELLOW
GREEN
BLUE
0
1
2
3
4
5
6
0
1
2
3
4
5
6
0
00
000
0000
00000
000000
2" WIDE AT ARC
2 1/2" AT ARC
3 1/2" AT ARC

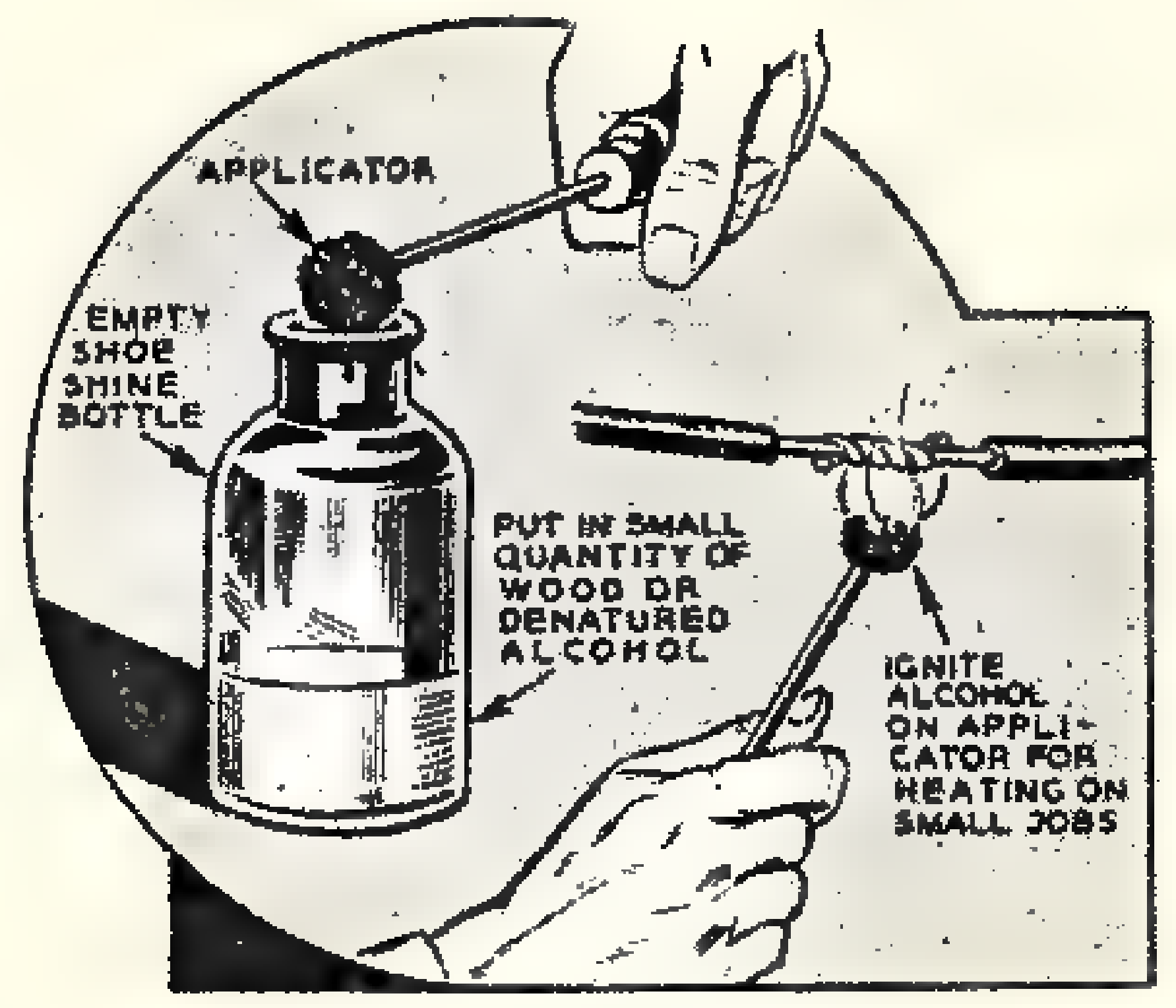
Cut from three pieces of cardboard this handy chart identifies the resistance of carbon color coded resistors as used in radio and electrical experiments. Paint divisions in colors indicated.

A CHART for identifying color coded resistors can be used for many experimental purposes in the workshop. Cut three cardboard angles to the sizes given and number each one from one to nine. Paint each numbered space in the color indicated and then assemble in fan-like fashion with either an eyelet or dress fastener. To use, arrange colors on chart to correspond with those on resistance. Numbers on colored spaces indicate ohms.

Polish Bottle Is Handy Torch

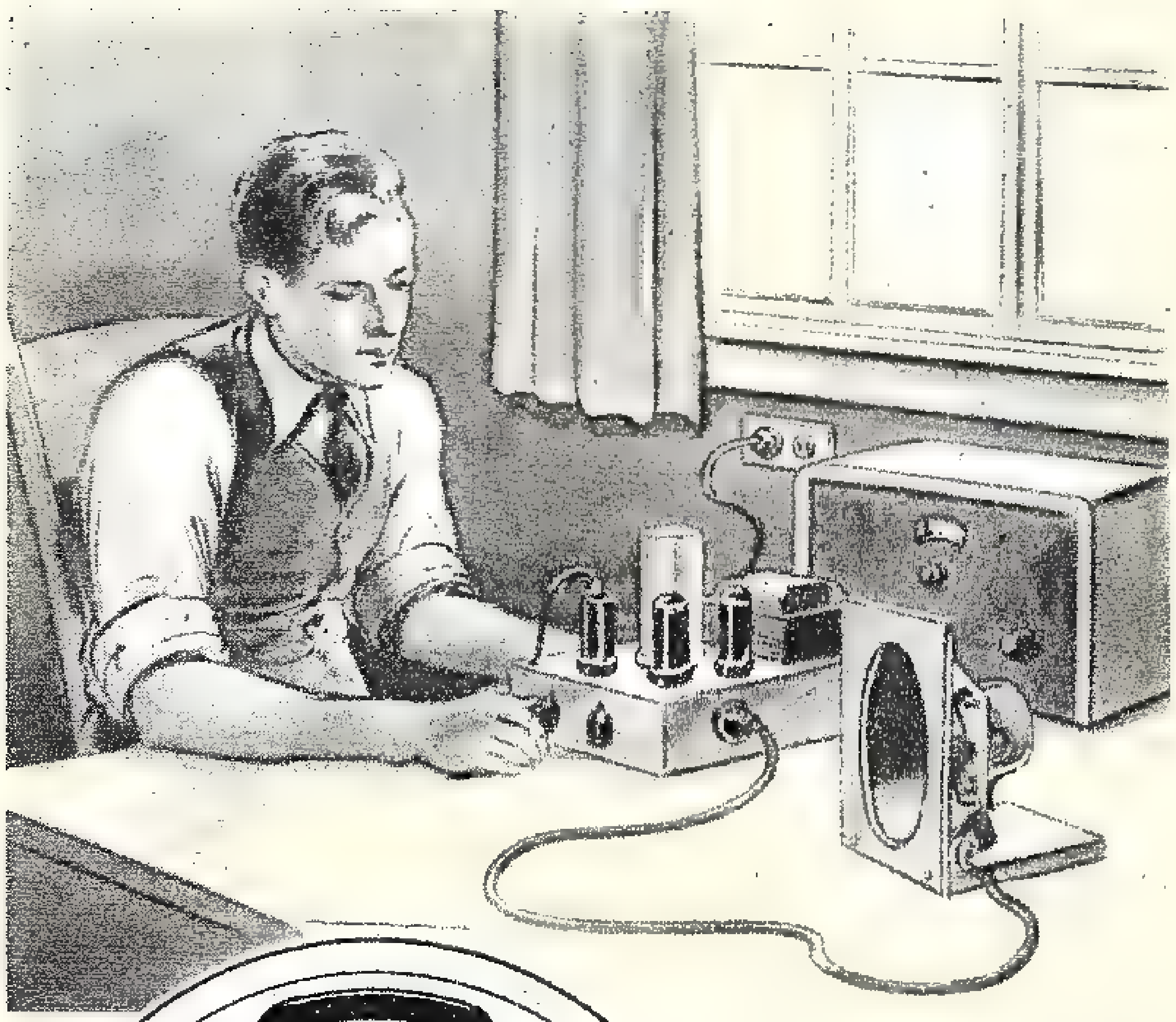
IN WORKING outdoors or in other places where a soldering iron is not available a simple torch for soldering can be used effectively. The torch is simplicity itself and consists of an empty shoe dressing bottle which has been partly filled with denatured alcohol.

The applicator is saturated in the fluid and a match applied to it. The torch will produce a hot flame which will prove sufficient for all kinds of light soldering work. When using a torch of this type it is a wise idea to use a solder which is prepared in a paste form and applied to joint to be soldered.


APPLICATOR
EMPTY SHOE SHINE BOTTLE
PUT IN SMALL QUANTITY OF WOOD OR DENATURED ALCOHOL
IGNITE ALCOHOL ON APPLICATOR FOR HEATING ON SMALL JOBS

An empty shoe dressing bottle partly filled with denatured alcohol makes a practical torch for soldering splices in house wiring.

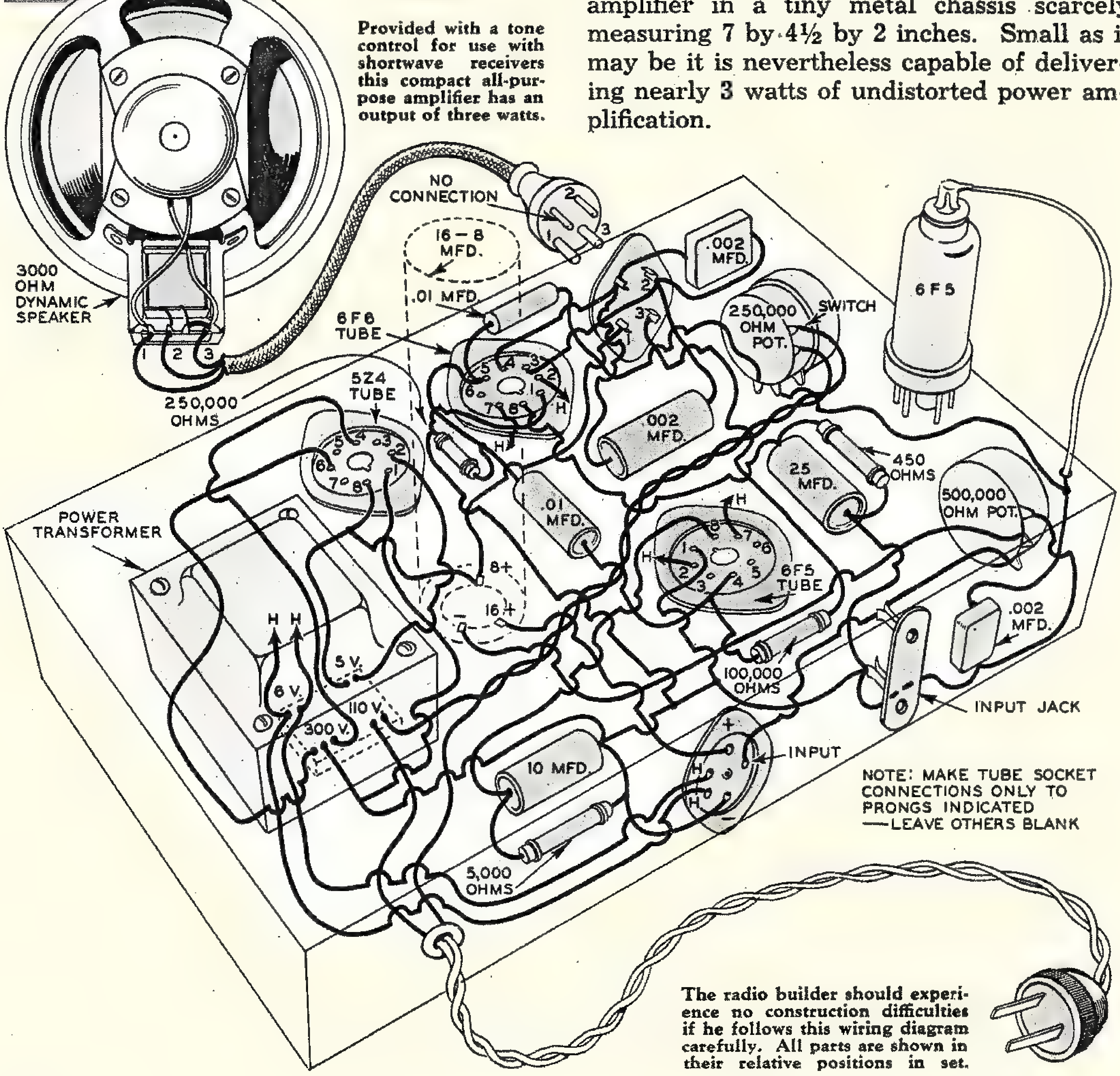
TINY AMPLIFIER FEATURES



Provided with a tone control for use with shortwave receivers this compact all-purpose amplifier has an output of three watts.

This compact metal tube amplifier provides both B power and speaker volume for small sets.

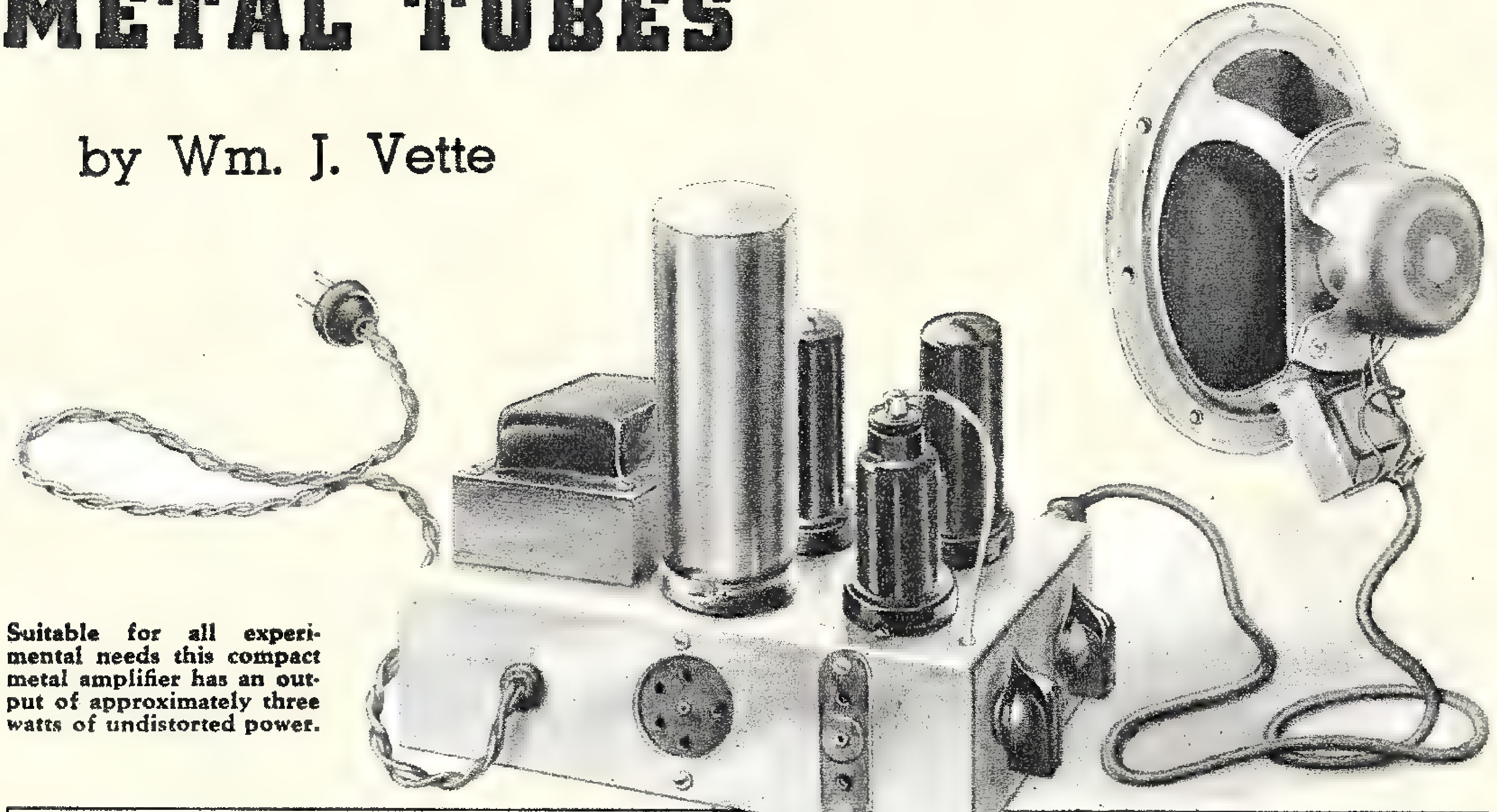
EVERY radio experimenter has occasion at some time to use an amplifier; especially if he owns a small two or three-tube short wave receiver. Until a few years ago any amplifier that had the least bit of output was a bulky affair weighing at least 25 pounds. With the improvements in radio design which have been made during the last few years it is now possible to construct a powerful little amplifier in a tiny metal chassis scarcely measuring 7 by 4½ by 2 inches. Small as it may be it is nevertheless capable of delivering nearly 3 watts of undistorted power amplification.


NO CONNECTION
3000 OHM DYNAMIC SPEAKER
1
2
3
16 – 8 MFD.
.01 MFD.
.002 MFD.
6F6 TUBE
250,000 OHM POT.
SWITCH
6F5
5Z4 TUBE
250,000 OHMS
.002 MFD.
H
25 MFD.
450 OHMS
.01 MFD.
500,000 OHM POT.
POWER TRANSFORMER
8+
16+
6F5 TUBE
.002 MFD.
H H
5 V.
6 V.
110 V.
300 V.
100,000 OHMS
INPUT JACK
10 MFD.
INPUT
5,000 OHMS
NOTE: MAKE TUBE SOCKET CONNECTIONS ONLY TO PRONGS INDICATED —LEAVE OTHERS BLANK

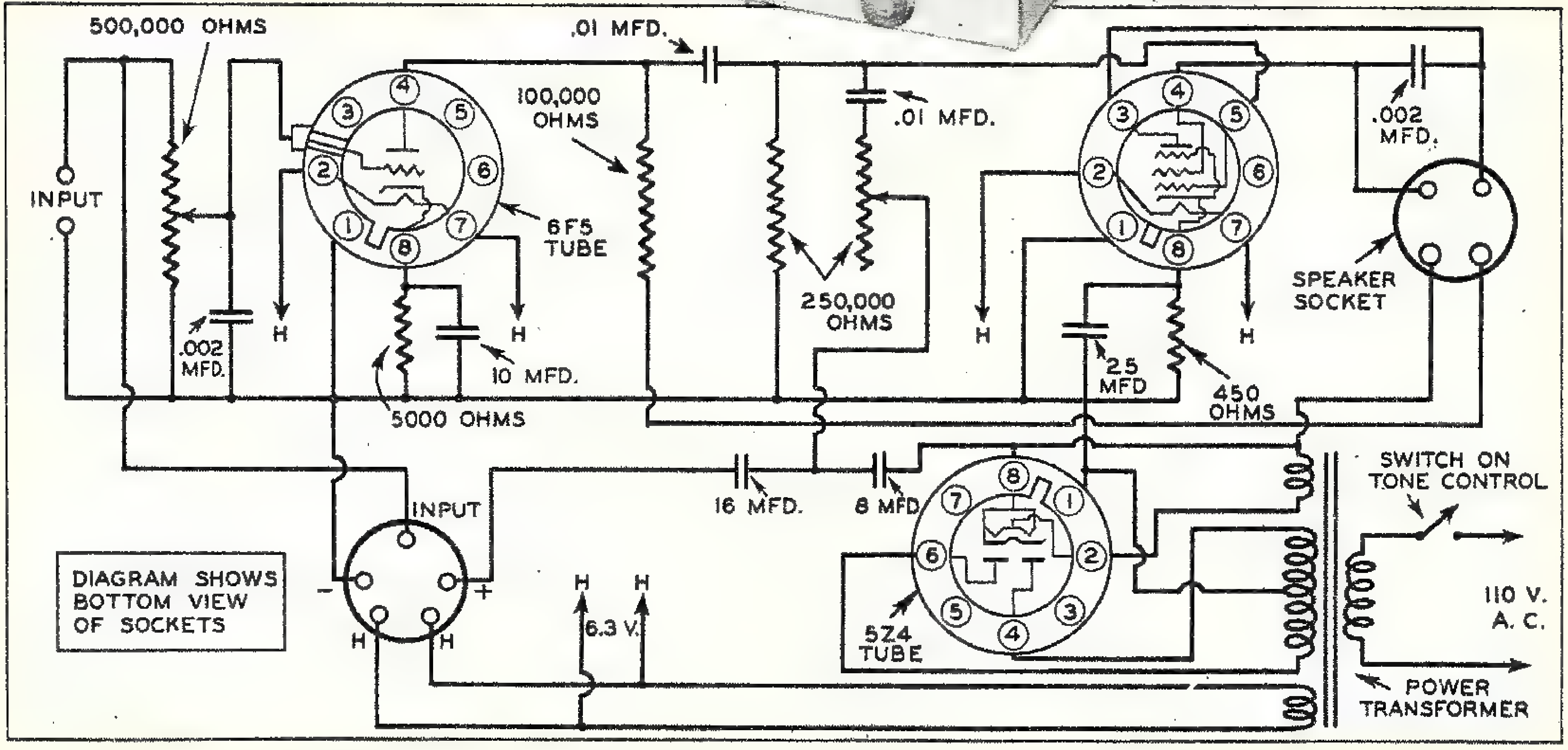
The radio builder should experience no construction difficulties if he follows this wiring diagram carefully. All parts are shown in their relative positions in set.

METAL TUBES

by Wm. J. Vette



Suitable for all experimental needs this compact metal amplifier has an output of approximately three watts of undistorted power.


500,000 OHMS
.01 MFD.
100,000 OHMS
.01 MFD.
.002 MFD.
INPUT
6F5 TUBE
SPEAKER SOCKET
250,000 OHMS
.002 MFD.
H
H
10 MFD.
5000 OHMS
H
H
25 MFD
450 OHMS
SWITCH ON TONE CONTROL
INPUT
16 MFD.
8 MFD
DIAGRAM SHOWS BOTTOM VIEW OF SOCKETS
-
+
H
H
H
H
6.3 V.
5Z4 TUBE
110 V. A. C.
POWER TRANSFORMER

If this schematic wiring diagram is followed along with the pictorial hook-up there is little chance for errors to occur. Note that the tube prongs are not all connected in the circuit since some are blank. Tube sockets, above, show the connections as they appear from the bottom of socket; pictorial diagram shows top view.

The construction is begun by forming the chassis from a sheet of alloy metal or aluminum. Of course, sheet iron may be used but it is more difficult to handle. After punching out the holes for the tube sockets, assemble the sockets and proceed to wire up the various parts. Work can be simplified if the pictorial and schematic diagrams are carefully studied before any actual construction is started.

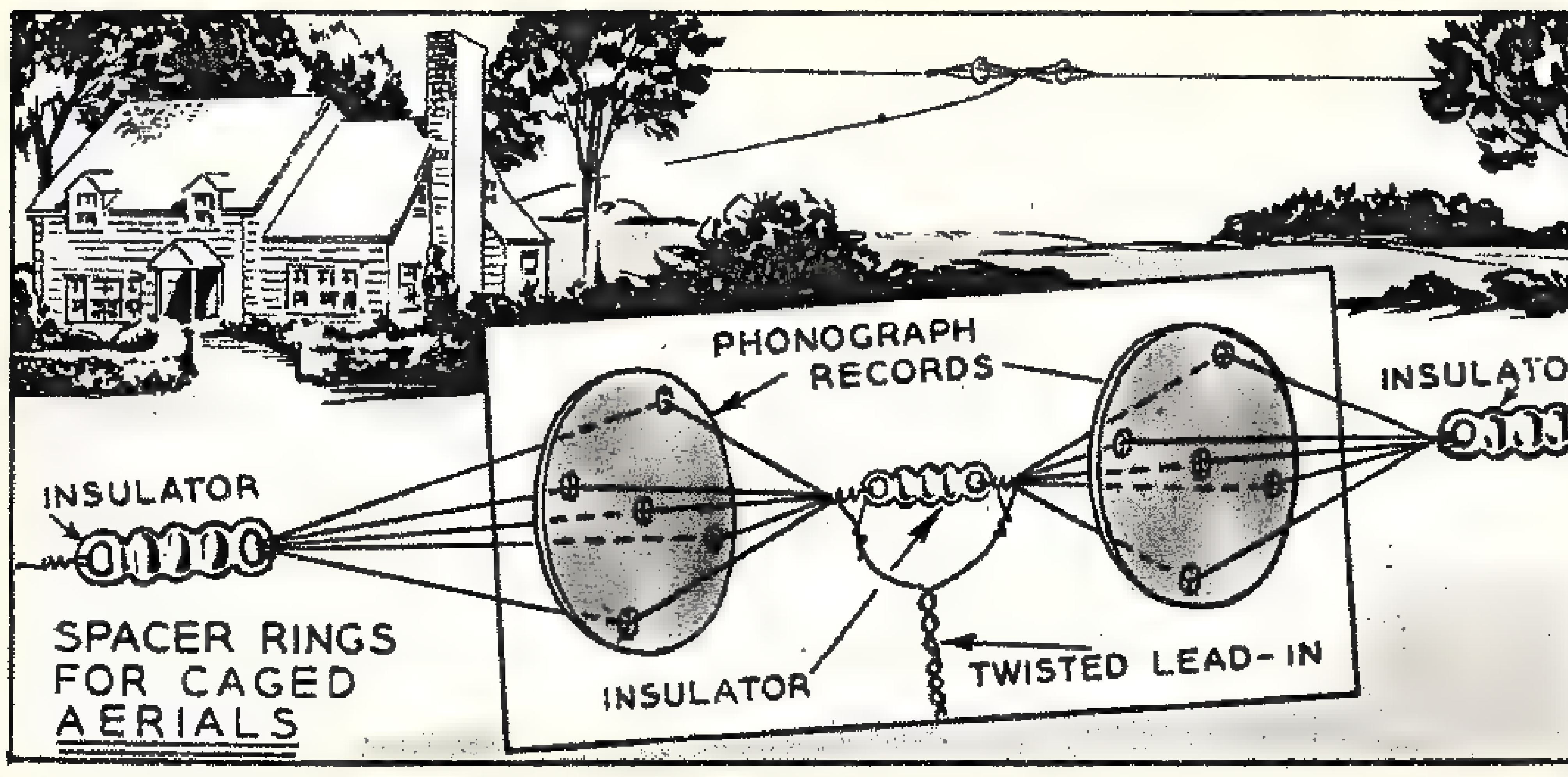
Examination of the circuit will reveal the use of three metal type tubes. A type 6F5 tube is used in the input, a type 6F6 in the output and a type 5Z4 rectifier tube in the power supply circuit. By wiring up these tubes according to the numbers appearing on the prongs in both the pictorial and schematic diagrams no difficulties will be encountered.

In order to operate the amplifier at its peak efficiency a novel code tone control is employed. One potentiometer serves as code tone control while the other is used to regulate volume. The volume control is fitted with an A. C. switch so that one control turns on the power and regulates the volume of the receiver as well.

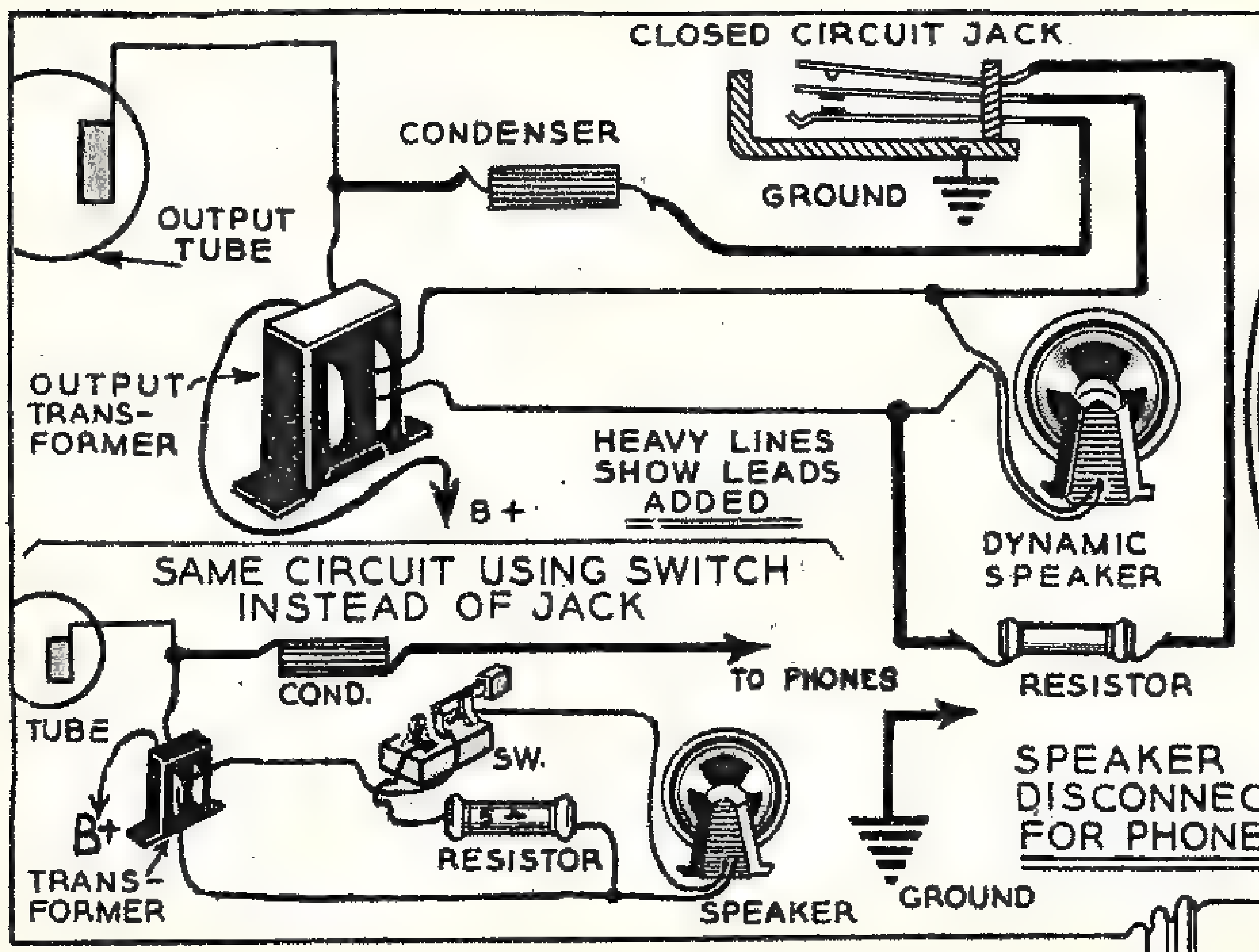
A unique feature of this amplifier is the self-contained B and filament power supply for supplying current to a small short wave

[*Continued on page* 132]

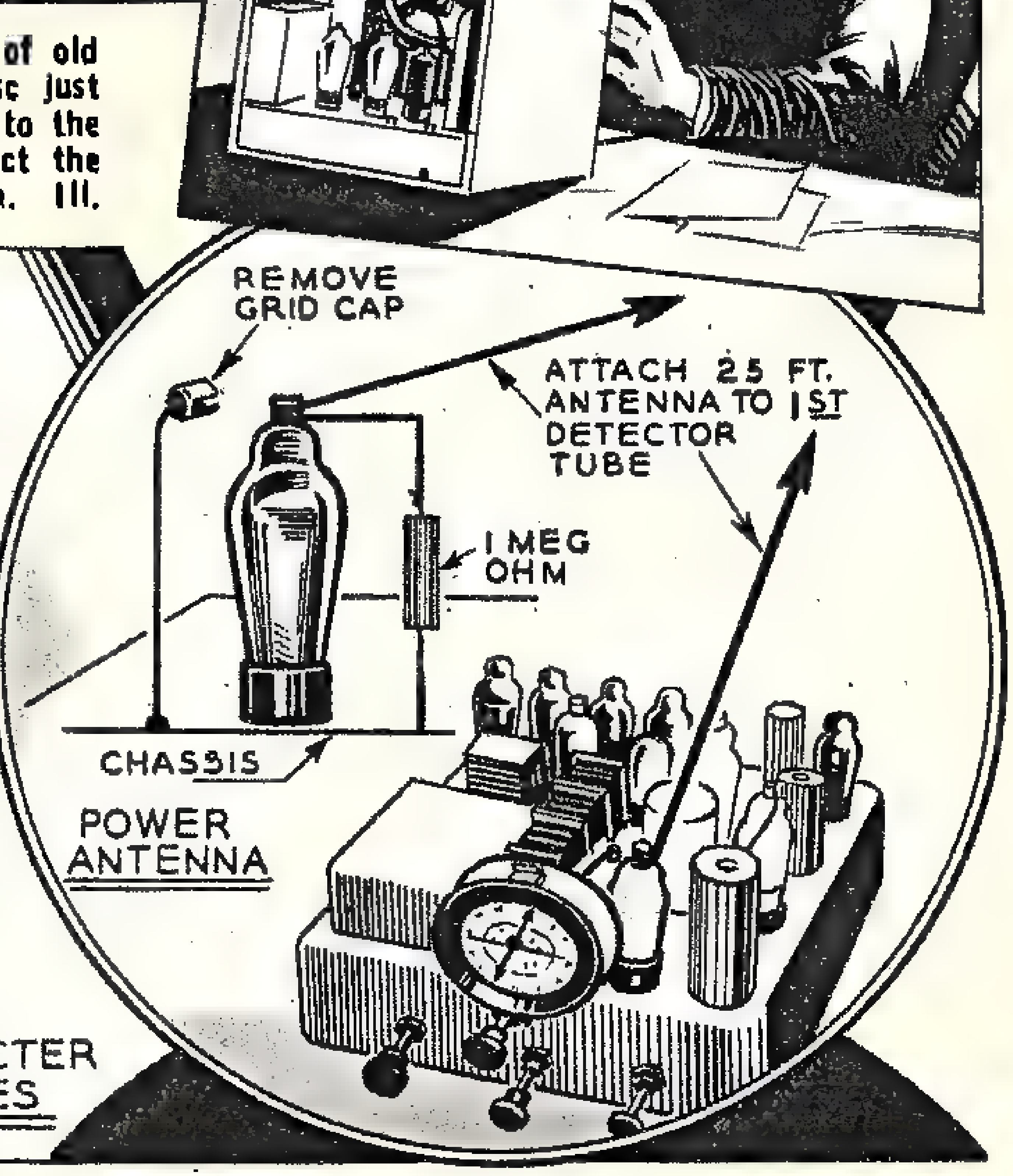
NEW IDEAS FOR THE RADIO FAN


PHONOGRAPH RECORDS
INSULATOR
INSULATOR
SPACER RINGS FOR CAGED AERIALS
INSULATOR
TWISTED LEAD-IN

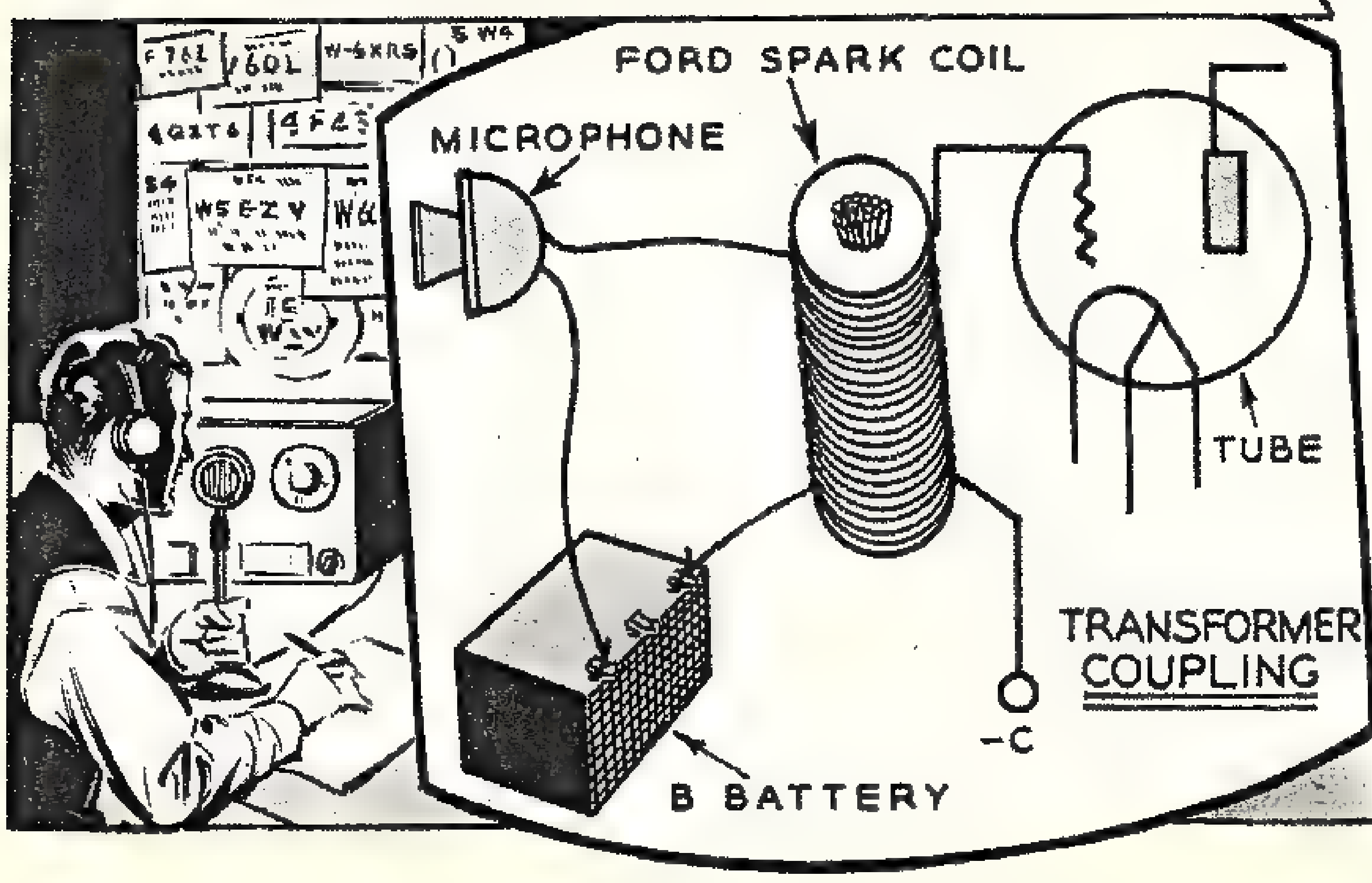
A novel form of DX short wave receiver antenna can be made by using a pair of old phonograph records for spacer insulators. Drill four small holes in each disc just large enough to pass No. 14 antenna wire and wire up the antenna according to the diagram shown above. For the lead-in wire use twisted fixture cord. Connect the antenna to the receiver through a coupling coil.—Morris Katz, Aurora, Ill.

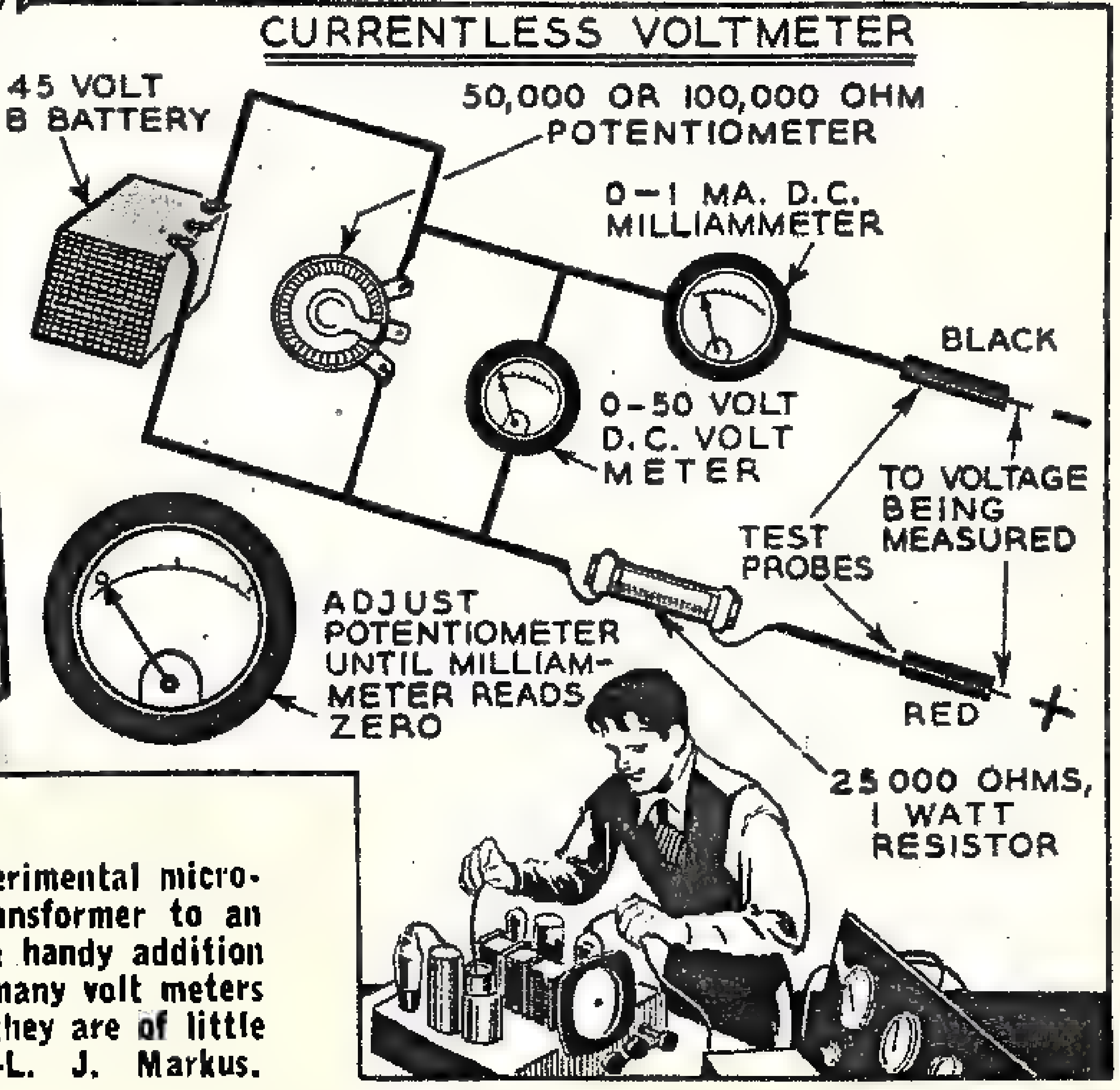

CLOSED CIRCUIT JACK
CONDENSER
GROUND
OUTPUT TUBE
OUTPUT TRANS-FORMER
HEAVY LINES SHOW LEADS ADDED
B+
DYNAMIC SPEAKER
SAME CIRCUIT USING SWITCH INSTEAD OF JACK
TUBE
COND.
TO PHONES
RESISTOR
SW.
B+
TRANS-FORMER
RESISTOR
SPEAKER
GROUND
SPEAKER DISCONNECTER FOR PHONES

Modern all-wave receivers which are not furnished with an earphone jack can be quickly provided with this valuable attachment by connecting a closed circuit jack in the output of the receiver in the manner described in the diagram pictured above. A 5-ohm, 10-watt resistance shunted across the voice coil of the speaker cuts it out when the earphones are used.—L. J. Markus, Washington, D. C.

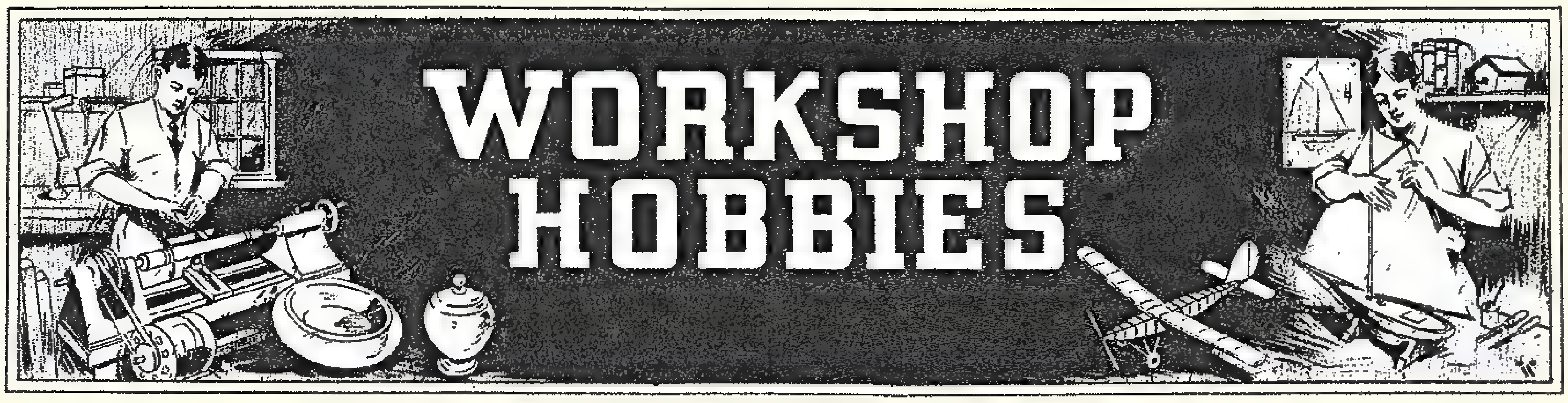

REMOVE GRID CAP
ATTACH 25 FT. ANTENNA TO 1ST DETECTOR TUBE
1 MEG OHM
CHASSIS
POWER ANTENNA

Connecting the antenna directly to the grid cap of the first detector tube of your all-wave receiver will increase the volume on low waves considerably. A one meg ohm carbon resistance is connected from ground or chassis of the receiver to the grid clip. Use 25 ft. antenna.—Arno Wilkens, Fleetwood, Pa.

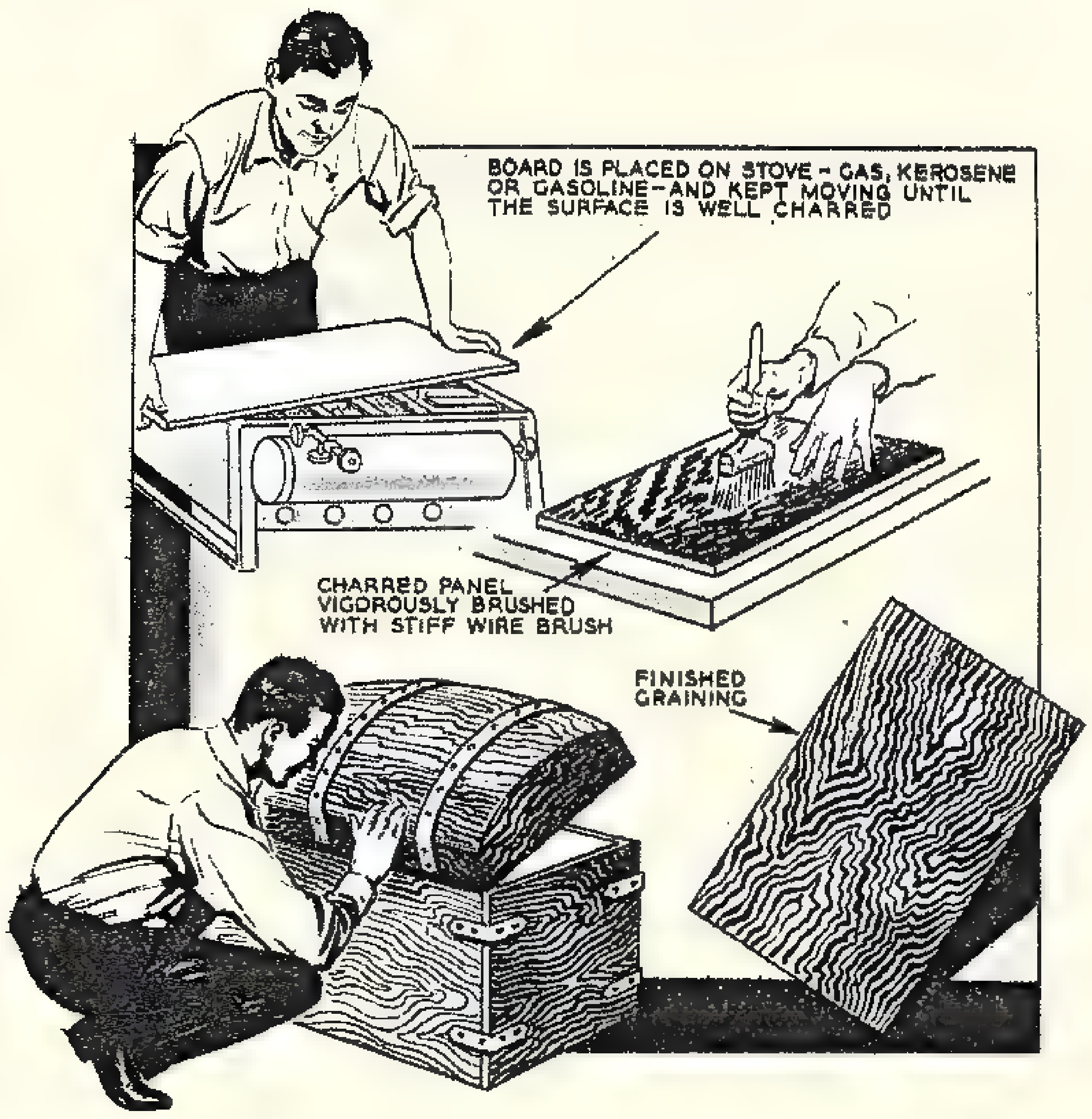

FORD SPARK COIL
MICROPHONE
TUBE
TRANSFORMER COUPLING
-C
B BATTERY


CURRENTLESS VOLTMETER
45 VOLT B BATTERY
50,000 OR 100,000 OHM POTENTIOMETER
0-1 MA. D.C. MILLIAMMETER
BLACK
0-50 VOLT D.C. VOLT METER
TO VOLTAGE BEING MEASURED
TEST PROBES
ADJUST POTENTIOMETER UNTIL MILLIAMMETER READS ZERO
RED
+
25 000 OHMS, 1 WATT RESISTOR

Above—The transformer from a Ford T spark coil unit makes a good experimental microphone coupling transformer. The method of connecting a telephone transformer to an amplifier is described in the illustration. Right—This test assembly is a handy addition to the experimenter's workbench and solves a perplexing problem. Since many volt meters have an internal resistance which prevents accurate voltage measurements they are of little value for ordinary use. This circuit provides accurate readings.—L. J. Markus.


WORKSHOP
HOBBIES

Decorate Woods With Japanese "Sugi" Finish


BOARD IS PLACED ON STOVE - GAS, KEROSENE OR GASOLINE - AND KEPT MOVING UNTIL THE SURFACE IS WELL CHARRED
CHARRED PANEL VIGOROUSLY BRUSHED WITH STIFF WIRE BRUSH
FINISHED GRAINING

Home workshop projects can be attractively finished with a Japanese "Sugi" effect by charring the surface of the wood over a stove then scraping off charred portion with wire brush.

BEAUTIFUL cabinets, panels and other articles with a finish similar to that of aged driftwood can be produced in the home workshop by anyone the least bit handy with tools. The finish which the Japanese have made famous as "Sugi" is best produced on a medium hard wood such as cyprus although white pine and similar woods can be used.

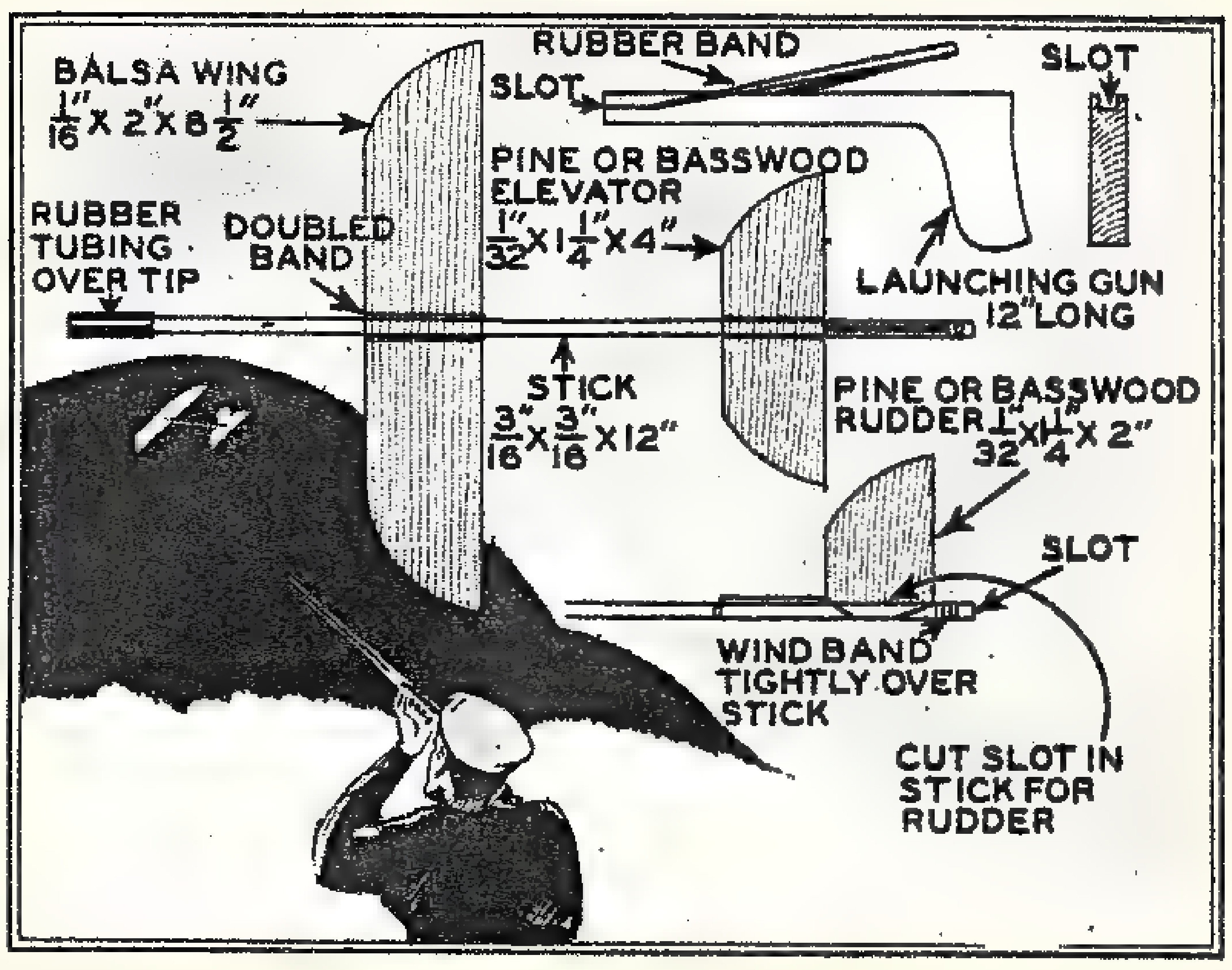
To produce the "Sugi" finish place the wood over a flame for about five minutes, or long enough for its surface to turn black. Remove the wood from the flame and briskly rub a wire brush over the charred surface following the direction of the grain. Brush away the burned wood until a chocolate color results then apply a coat of clear varnish to this surface. The varnish will bring out the grain revealing a beautiful surface equal to the Japanese finish, itself.

Many attractive home decorations can be made from wood which has first been prepared in the manner described above. On hard woods it may be necessary to burn the surface several times after the initial scraping until the correct color and grain effect is obtained.

Gun Catapults Toy Planes

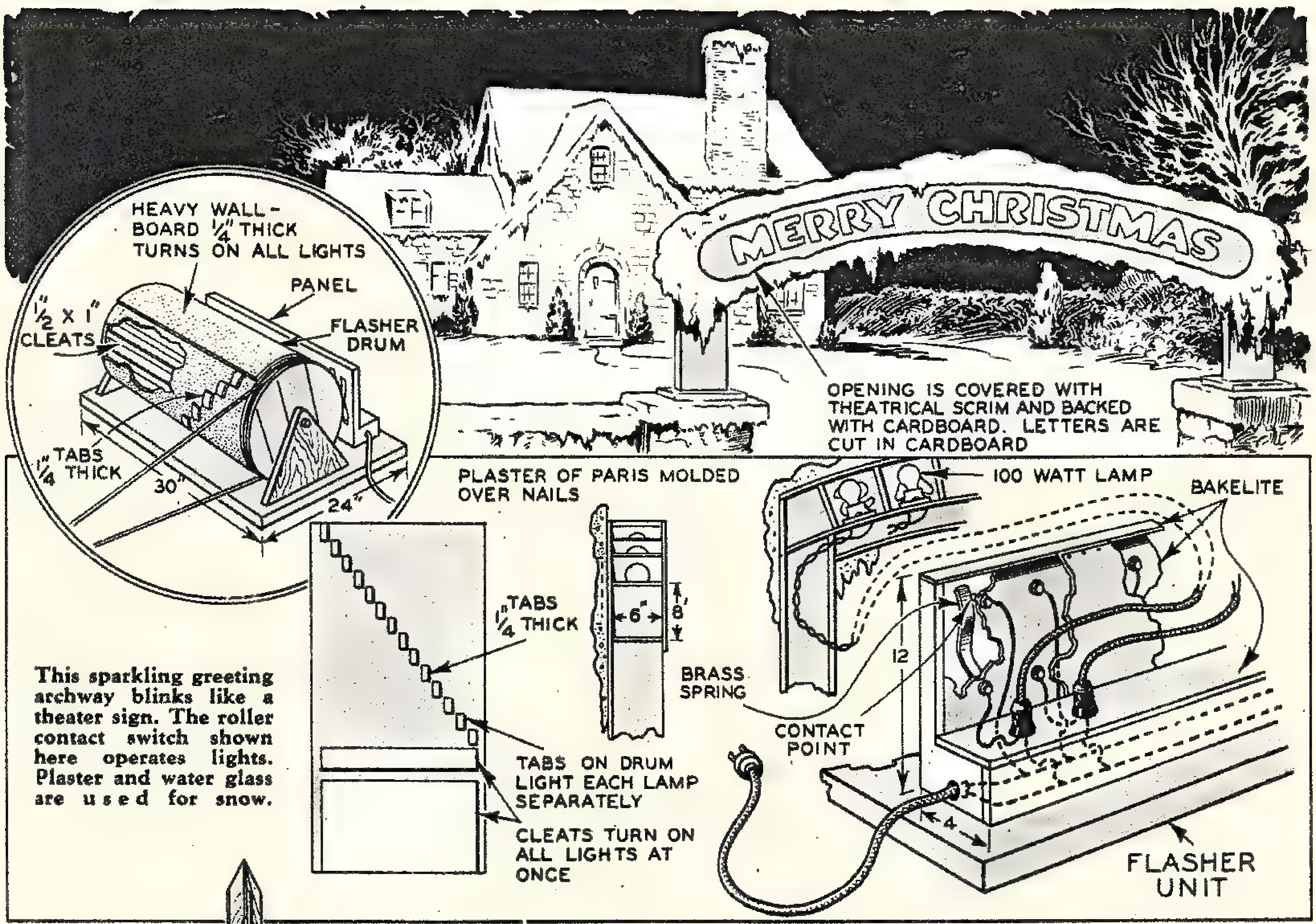
SHOOTING miniature glider planes into the air with a sling-shot pistol is great fun especially if a dozen planes are constructed and fired into the air in rapid succession. The planes are simple to construct since they consist of just four pieces of balsa wood, the rudder, the stick, wing and elevator. The wing structure is $\frac{1}{16}$-inch balsa as are rudder and elevator. The stick is cut from a one-foot length of $\frac{3}{16}$ by $\frac{3}{16}$-inch and notched at one end to allow for the insertion of the rudder. The wings are fastened to the stick with rubber bands. Adjust the wing position until the glider sails in an even flight.

The pistol is cut from a piece of white pine or similar stock and slotted at one end to take a rubber band for catapulting the glider. A groove in the top of the gun permits the stick to slide freely in it. To shoot the planes place the stick in the groove, hook the rubber band over the rudder end of the stick and pull back.


BALSA WING $\frac{1}{16}$" X 2" X 8$\frac{1}{2}$"
RUBBER BAND
SLOT
SLOT
PINE OR BASSWOOD ELEVATOR $\frac{1}{32}$" X 1$\frac{1}{4}$" X 4"
RUBBER TUBING OVER TIP
DOUBLED BAND
LAUNCHING GUN 12" LONG
STICK $\frac{3}{16}$" X $\frac{3}{16}$" X 12"
PINE OR BASSWOOD RUDDER $\frac{1}{32}$" X 1$\frac{1}{4}$" X 2"
SLOT
WIND BAND TIGHTLY OVER STICK
CUT SLOT IN STICK FOR RUDDER

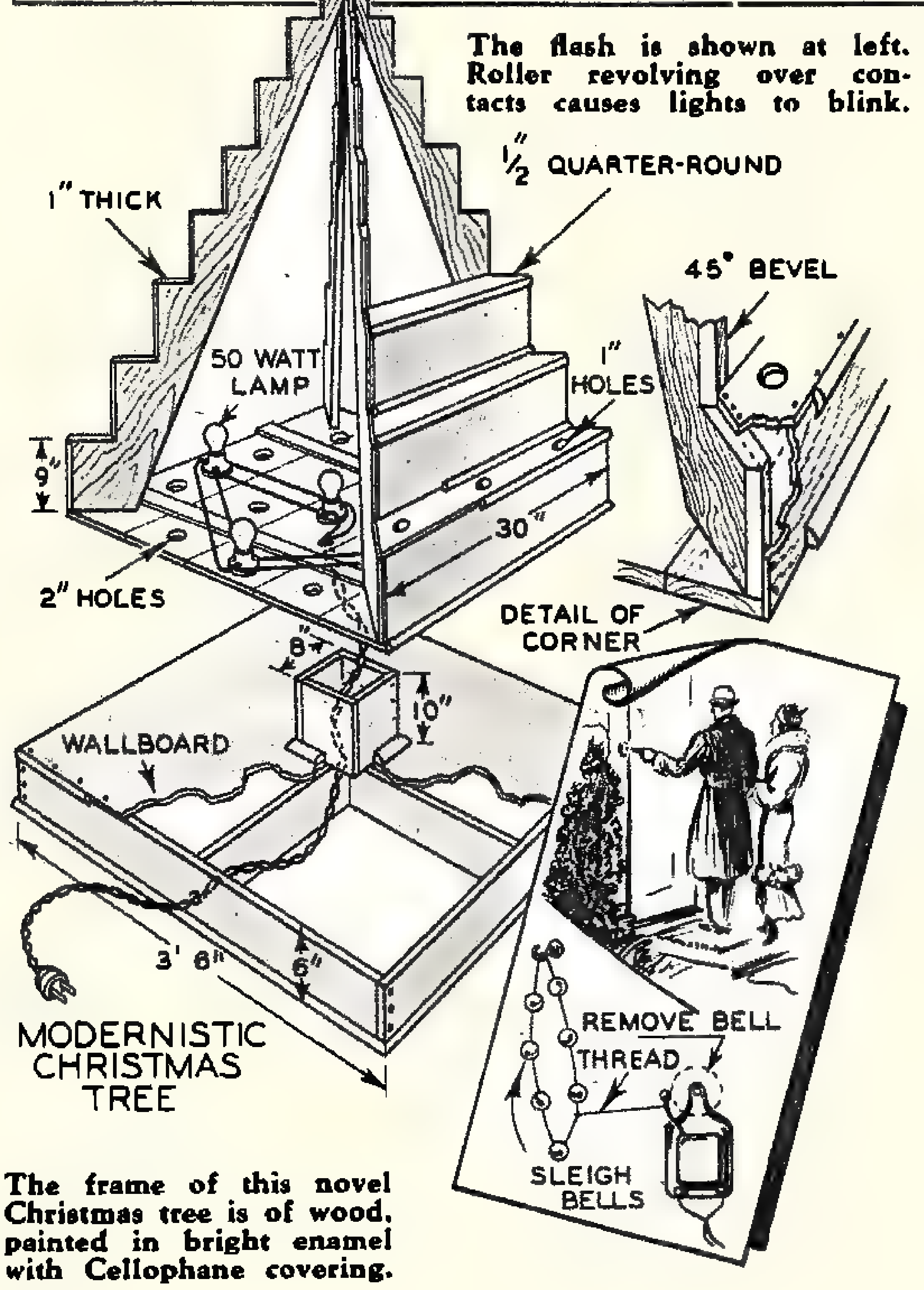
Balsa glider planes like the one shown here loop and zoom through the air for several minutes. A sling-shot pistol, carved from soft wood, launches planes. Rubber bands hold wings.

EXTEND HOLIDAY GREETINGS


HEAVY WALL-BOARD 1/4" THICK TURNS ON ALL LIGHTS
PANEL
1/2 x 1" CLEATS
FLASHER DRUM
1/4" TABS THICK
30"
24"
MERRY CHRISTMAS
OPENING IS COVERED WITH THEATRICAL SCRIM AND BACKED WITH CARDBOARD. LETTERS ARE CUT IN CARDBOARD
PLASTER OF PARIS MOLDED OVER NAILS
1/4" TABS THICK
6"
8"
TABS ON DRUM LIGHT EACH LAMP SEPARATELY
CLEATS TURN ON ALL LIGHTS AT ONCE
100 WATT LAMP
BAKELITE
BRASS SPRING
CONTACT POINT
12
4
FLASHER UNIT

This sparkling greeting archway blinks like a theater sign. The roller contact switch shown here operates lights. Plaster and water glass are used for snow.

The flash is shown at left. Roller revolving over contacts causes lights to blink.


1" THICK
1/2 QUARTER-ROUND
45° BEVEL
50 WATT LAMP
1" HOLES
9"
30"
2" HOLES
DETAIL OF CORNER
8"
10"
WALLBOARD
3' 6"
6"
MODERNISTIC CHRISTMAS TREE
REMOVE BELL
THREAD
SLEIGH BELLS

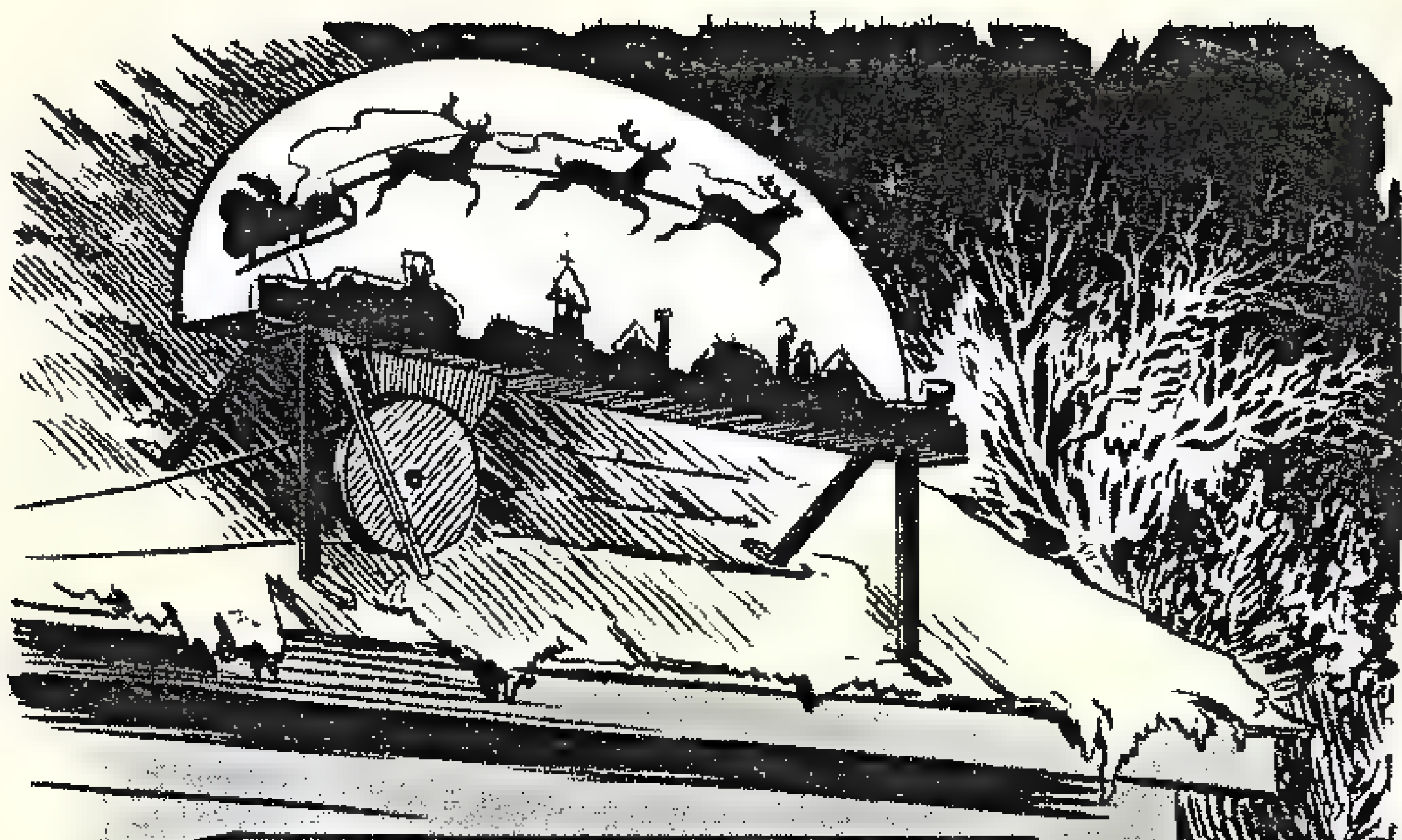
The frame of this novel Christmas tree is of wood, painted in bright enamel with Cellophane covering.

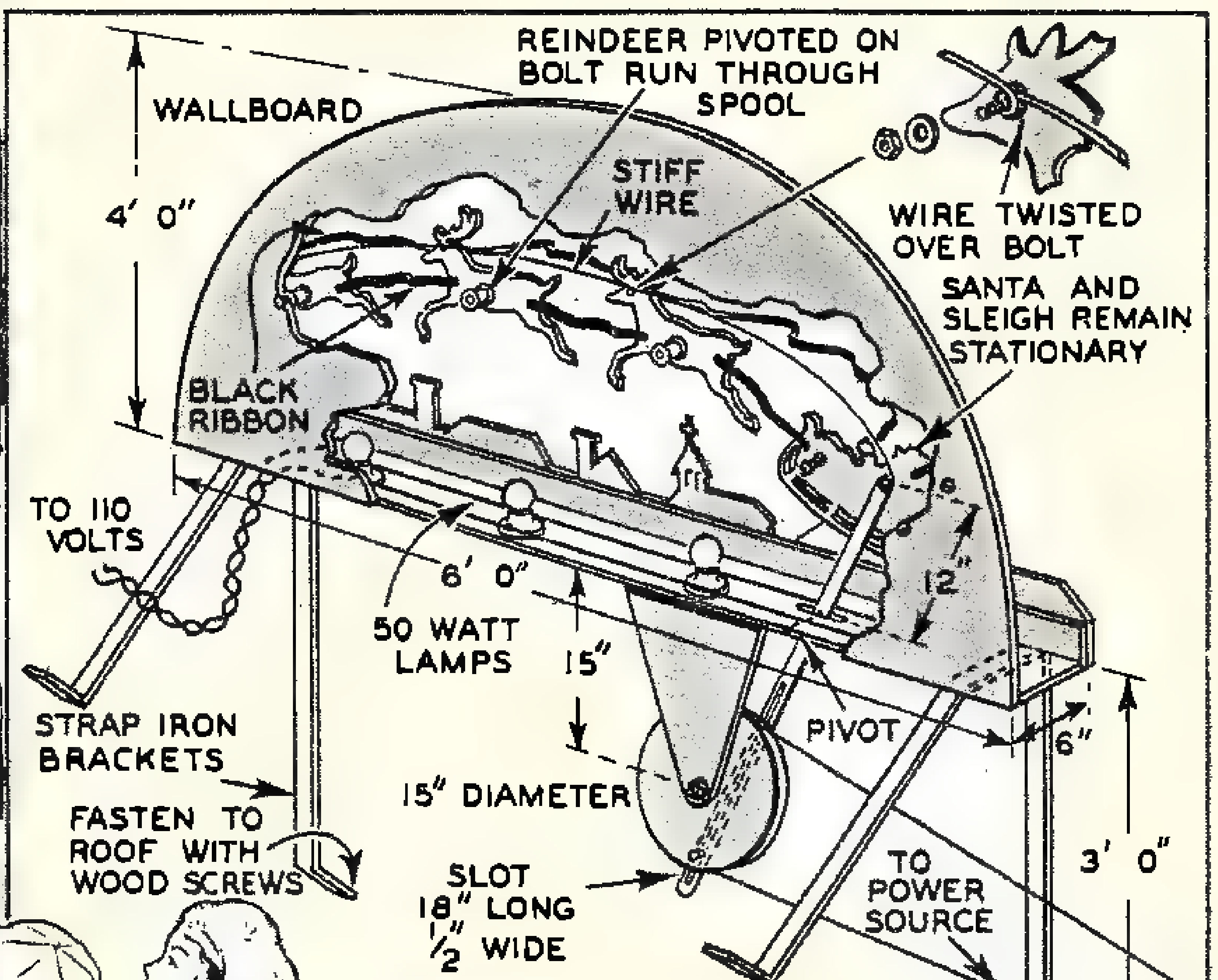
by David A. Brown

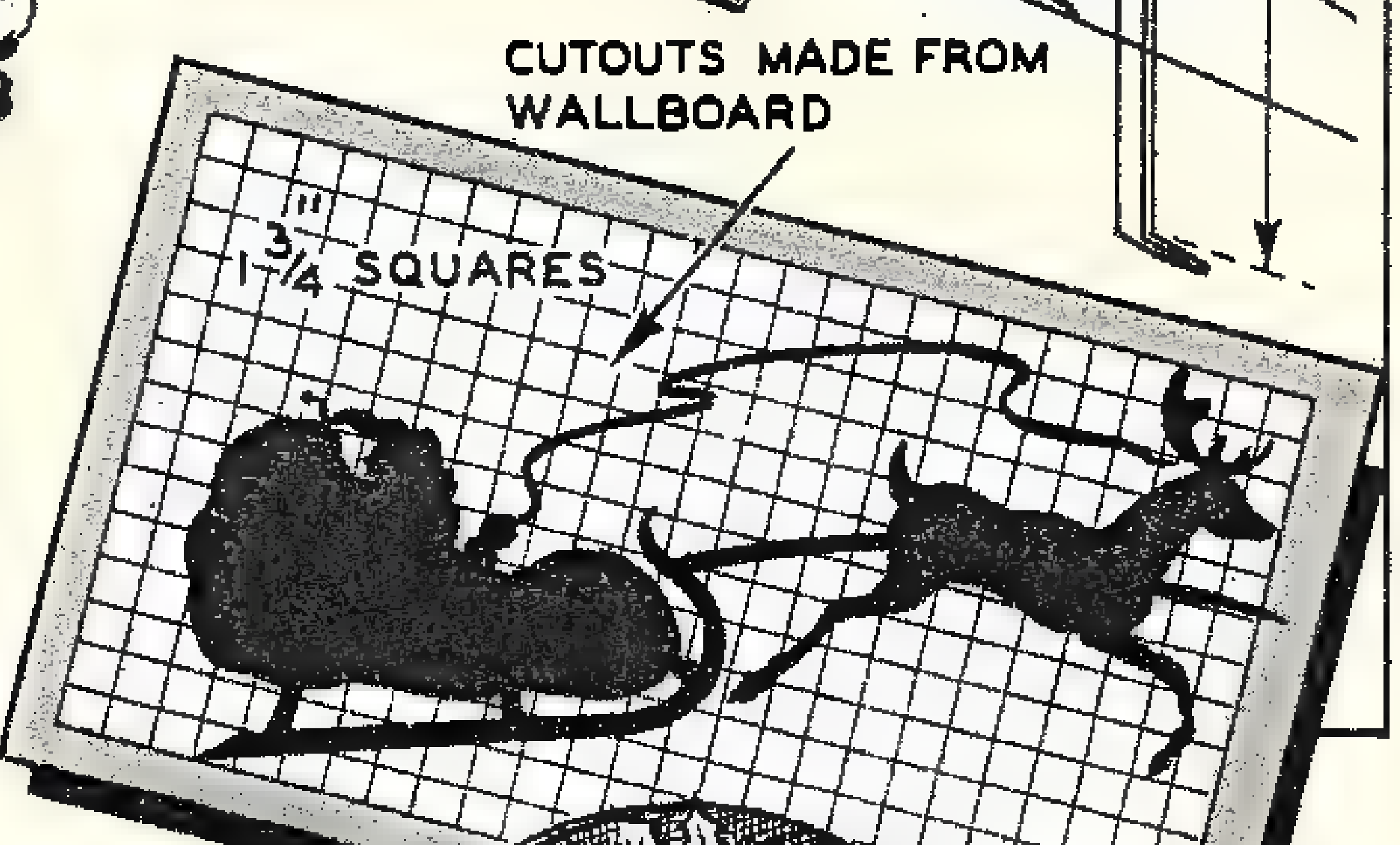
IN THE creation of novel Christmas decorations for the home, amateur craftsmen will encounter many interesting tests of skill and ingenuity. Carpentry, electricity and metal working all play a part in the adapting of the traditional symbols of the season to modern ideas of design and utility, and the workshop enthusiast who directs his attentions toward such a seasonable project is certain to enjoy many hours of entertaining work; his home will reflect the spirit of the occasion; and he will have the satisfaction of knowing that he has done much to preserve the beautiful customs long associated with this ancient holiday.

By combining light and shadow with motion, an unusual house top decoration may be contrived from the time honored Santa and reindeers. Cover the accompanying illustration with a sheet of tracing paper ruled into 1/8" squares and, with the intersecting lines as guides, transfer the figures to a 4'x6' piece of wall board which has been marked off into

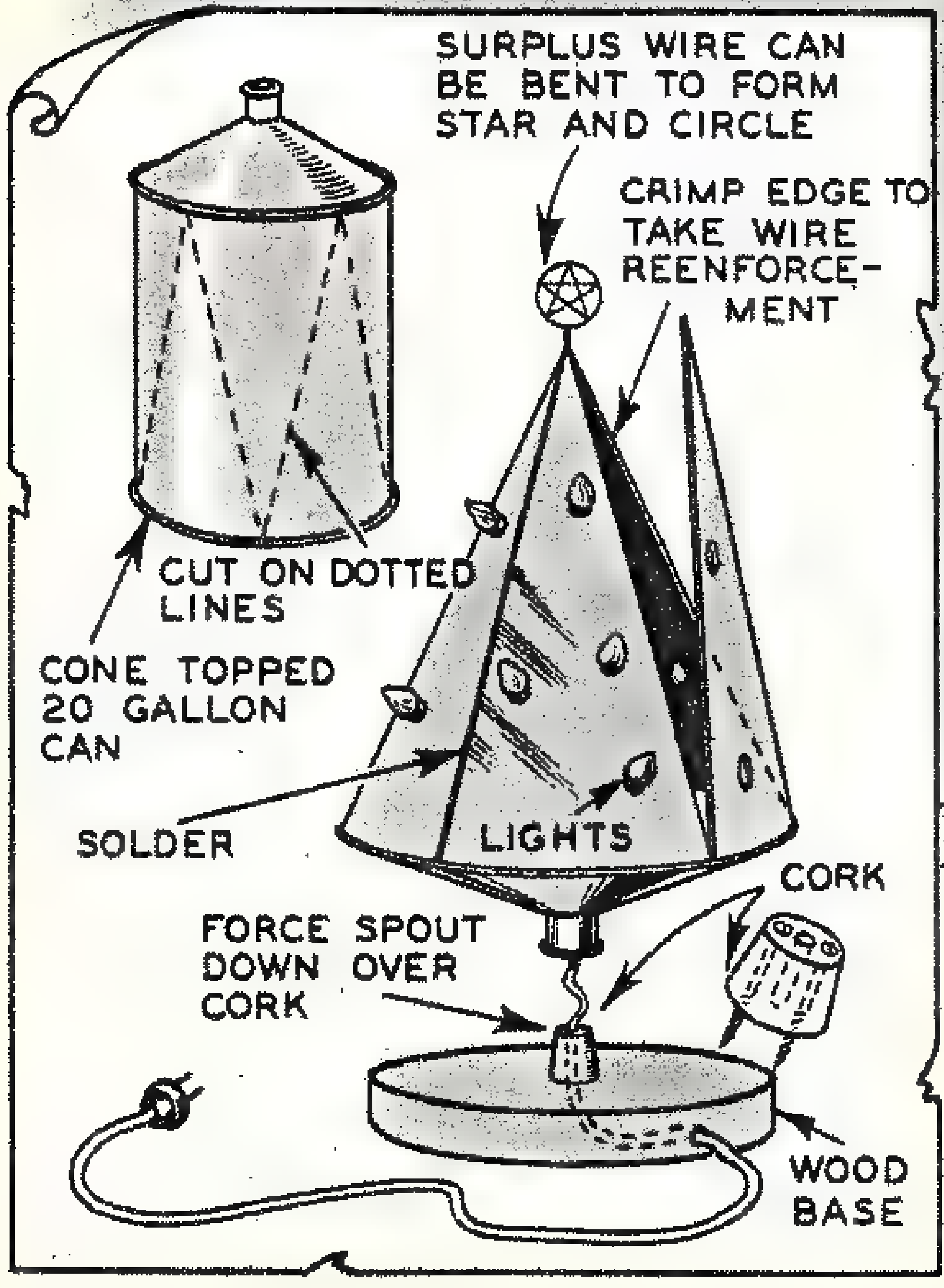
WITH OUTDOOR DECORATIONS




REINDEER PIVOTED ON BOLT RUN THROUGH SPOOL
WALLBOARD
4' 0"
STIFF WIRE
WIRE TWISTED OVER BOLT
SANTA AND SLEIGH REMAIN STATIONARY
BLACK RIBBON
TO 110 VOLTS
6' 0"
50 WATT LAMPS
15"
12"
6"
PIVOT
STRAP IRON BRACKETS
15" DIAMETER
FASTEN TO ROOF WITH WOOD SCREWS
SLOT 18" LONG 1/2" WIDE
TO POWER SOURCE
3' 0"


CUTOUTS MADE FROM WALLBOARD
1 3/4" SQUARES

This animated decoration of Santa and his reindeer is easy to make if above details are followed.

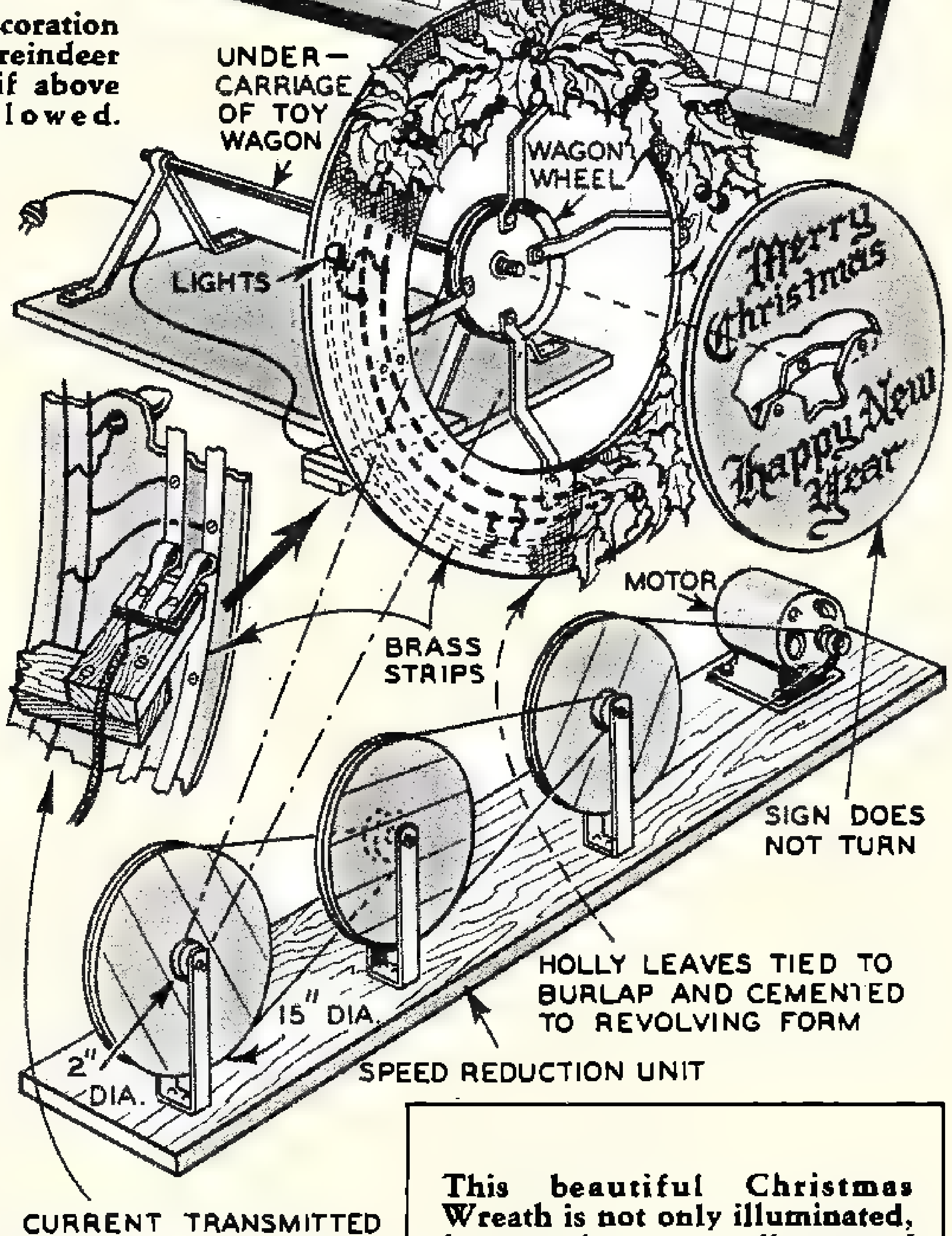

SURPLUS WIRE CAN BE BENT TO FORM STAR AND CIRCLE
CRIMP EDGE TO TAKE WIRE REENFORCEMENT
CUT ON DOTTED LINES
CONE TOPPED 20 GALLON CAN
SOLDER
LIGHTS
CORK
FORCE SPOUT DOWN OVER CORK
WOOD BASE

A 20-gallon oil drum provided this novel Christmas tree. Cut the can as shown, insert several sets of tree lights and then solder together and mount the tree on a suitable wooden base.

1¾" squares. On similar material, lay out the semi-circular background. Cut out all pieces, and paint the silhouettes black and the background blue. Coat this last with shellac and sprinkle with mica sign painter's brilliants while still wet. Tack the house tops to the front edge and the background to the rear edge of a light trough constructed of 1"x6" material. Wire this trough to take four 50-watt blue colored light bulbs and cut the opening through which the slotted lever passes. Swing this lever on the shank of a long wood screw or heavy nail driven through it from the rear edge of the trough.

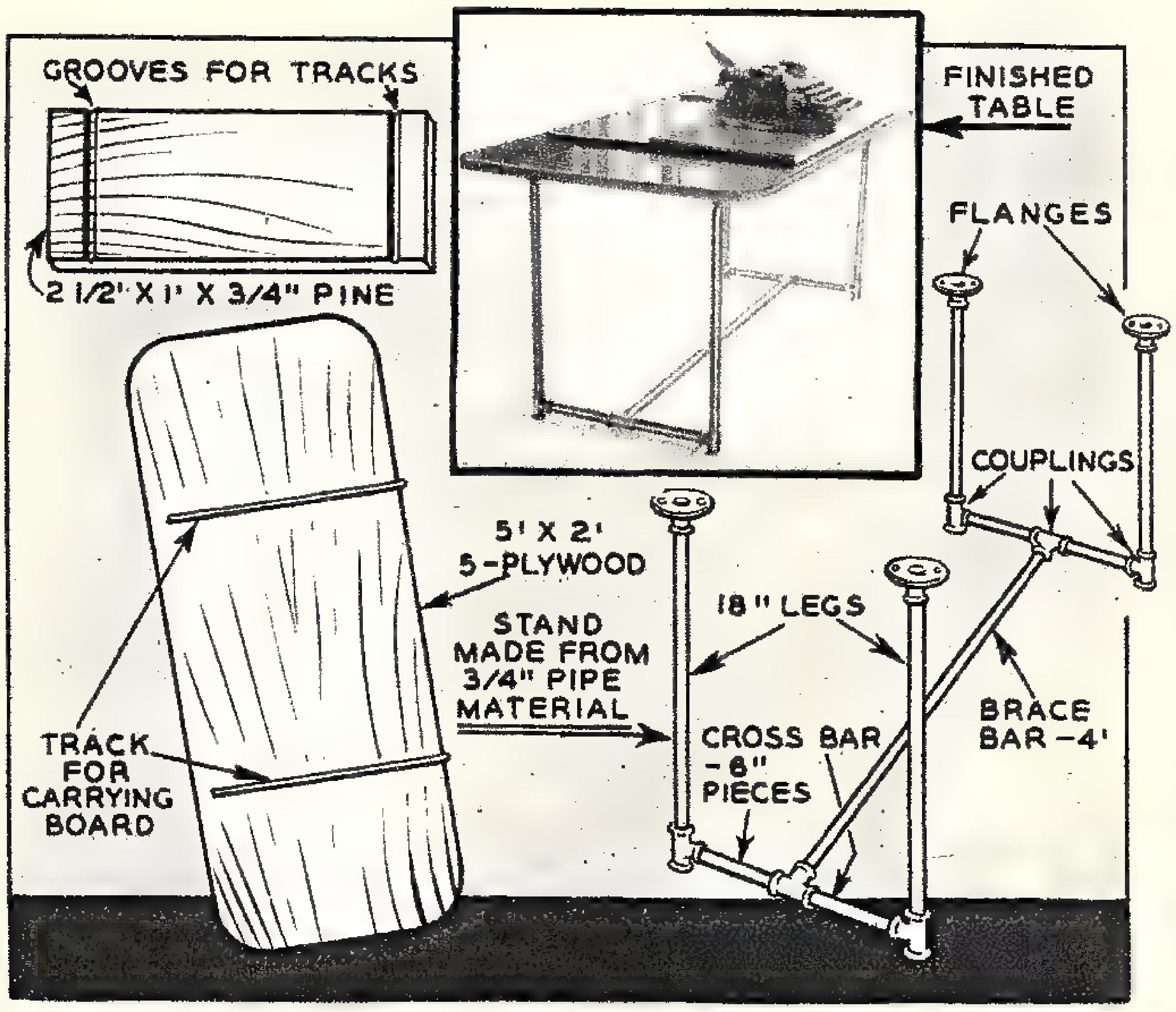
Screw two wooden candy pail lids together so that their beveled edges form a belt groove and mount it on a ¼"x3" bolt lock-nutted to the single wood support which projects down from the bottom of the light trough. A lock-nutted bolt set on the outer circumference

[*Continued on page* 132]


UNDER-CARRIAGE OF TOY WAGON
WAGON WHEEL
LIGHTS
Merry Christmas
Happy New Year
MOTOR
BRASS STRIPS
SIGN DOES NOT TURN
HOLLY LEAVES TIED TO BURLAP AND CEMENTED TO REVOLVING FORM
15" DIA.
2" DIA.
SPEED REDUCTION UNIT
CURRENT TRANSMITTED TO WREATH THROUGH TWO SPRING CONTACTS

This beautiful Christmas Wreath is not only illuminated, but revolves, as well, around the center greeting. Below it is shown the motor speed reducer.

PIPE FITTINGS FORM MODERN DESK


GROOVES FOR TRACKS
2 1/2' X 1' X 3/4" PINE
FINISHED TABLE
FLANGES
COUPLINGS
5' X 2' 5-PLYWOOD
STAND MADE FROM 3/4" PIPE MATERIAL
18" LEGS
TRACK FOR CARRYING BOARD
CROSS BAR - 6" PIECES
BRACE BAR - 4'

Fashioned from lengths of scrap pipe this modern typewriter desk features a sliding typewriter platform so that the machine can be pushed out of the way when not in use. The top is cut from a panel of five-ply veneer.

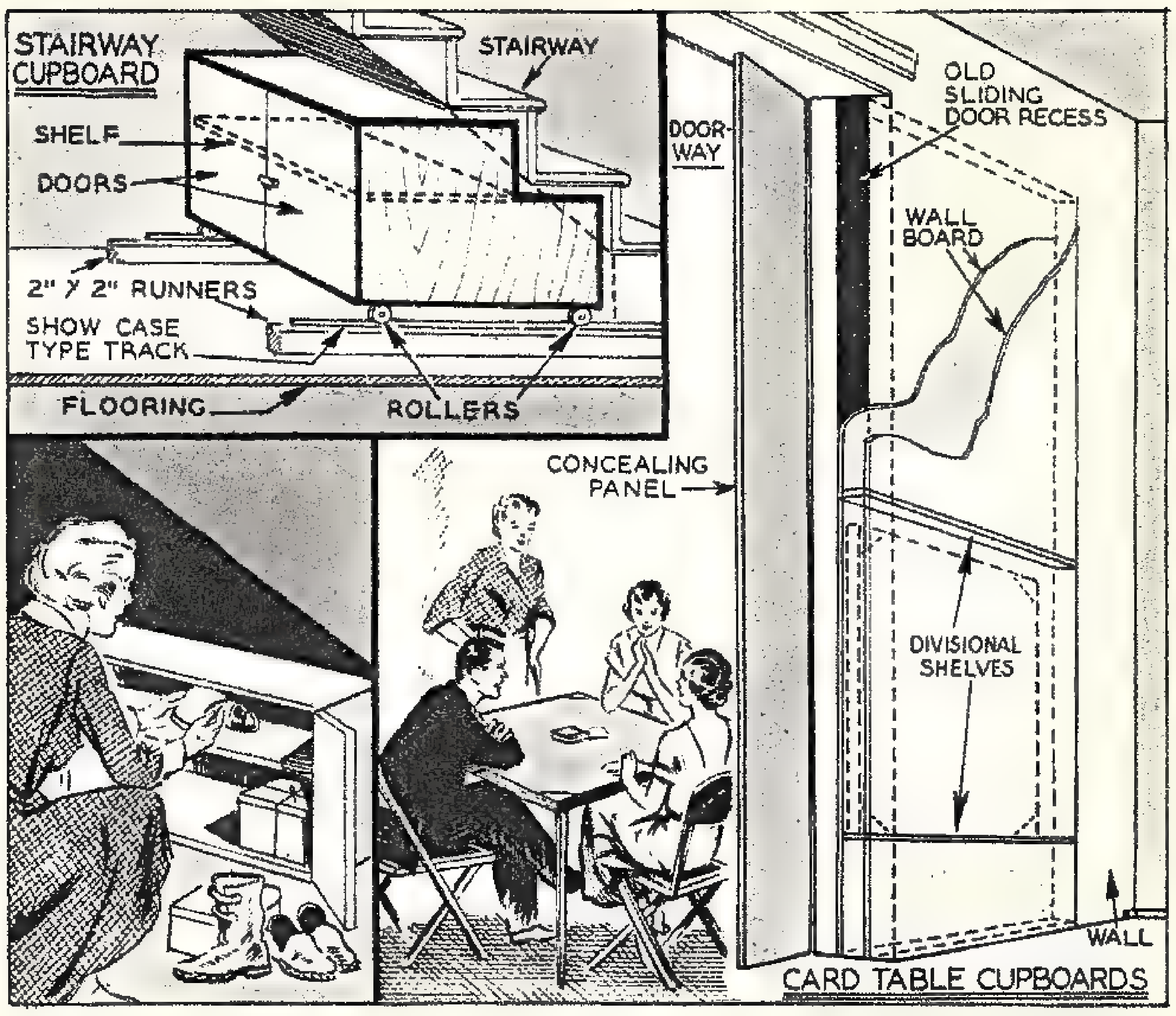
A TYPEWRITER desk styled after the modern trend can be assembled in a few hours from a few lengths of scrap pipe cut down, threaded and joined with the necessary fittings then attached to a plywood top. A unique feature of this desk is the sliding typewriter platform which permits the machine to be pushed to the rear of the desk when not in use.

Cut the pipe to the lengths indicated in the diagrams shown at the left and after assembling attach the top which is a 5-ply veneer panel measuring 2 by 5 feet. In the center of the desk top place a pair of showcase door tracks for the typewriter platform to roll on. The platform is cut from a piece of ¾-inch white pine and measures 2½ by 1 feet. Rollers are attached to the bottom of the platform to match the desk top tracks. The completed desk can be enameled in any modern contrast. Blue, green or red enamel may be used for the top with the metal frame in a silver finish. The typewriter platform is enameled in black. The typewriter is permanently left on the platform.

Utilizing Home's Odd Corners

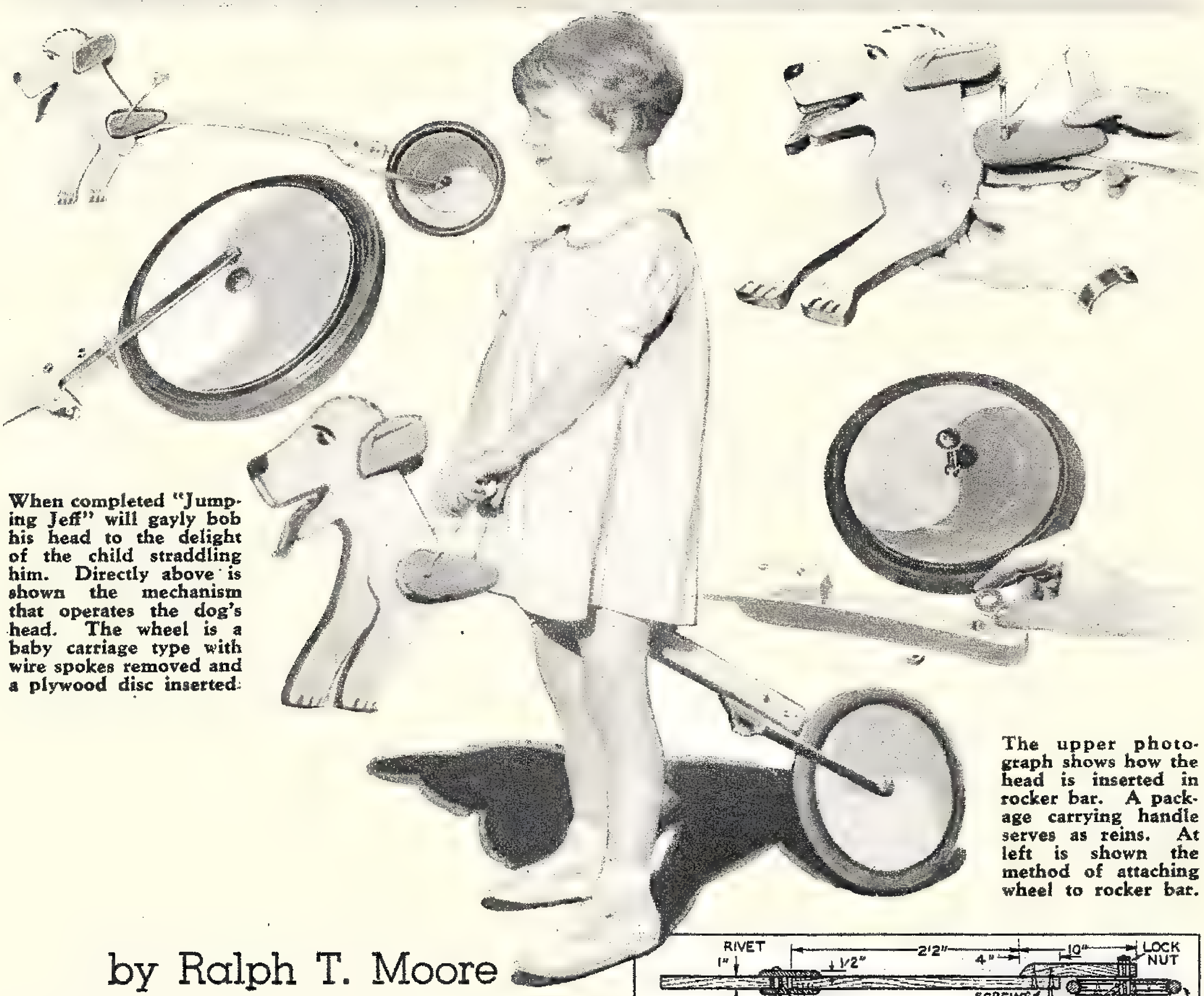
IN NEARLY every home, both new and old, there are many nooks and corners that can be converted with a little work into valuable storage space. Take for example a home that at one time had been fitted with sliding doors, but which since have been removed to abide with the changing times. A door constructed of wallboard to fit the sliding door recess can be fitted with shelves so that two card tables can be stored in them with sufficient space left at the bottom for several umbrellas, canes or other long compact articles.

The space just under the stairs landing is also valuable storage space and by constructing a suitable closet or cupboard many small articles can be conveniently stored away when not being used. The cupboard should follow the construction of the stairs and be provided with rollers so that it can be pushed out of the way after articles have been deposited in it. The shelves make a convenient place for junior's toys.


STAIRWAY CUPBOARD
STAIRWAY
SHELF
DOORS
DOOR-WAY
2" X 2" RUNNERS
SHOW CASE TYPE TRACK
FLOORING
ROLLERS
OLD SLIDING DOOR RECESS
WALL BOARD
CONCEALING PANEL
DIVISIONAL SHELVES
WALL
CARD TABLE CUPBOARDS

Odd corners about the home can be converted, as shown here, into valuable closet space. A hollow wallboard door inserted in a sliding door recess makes a handy card table closet. Space under stairs can be utilized, too.

"Jumping Jeff"—A Tiny Tot's Toy



When completed "Jumping Jeff" will gayly bob his head to the delight of the child straddling him. Directly above is shown the mechanism that operates the dog's head. The wheel is a baby carriage type with wire spokes removed and a plywood disc inserted.

The upper photograph shows how the head is inserted in rocker bar. A package carrying handle serves as reins. At left is shown the method of attaching wheel to rocker bar.

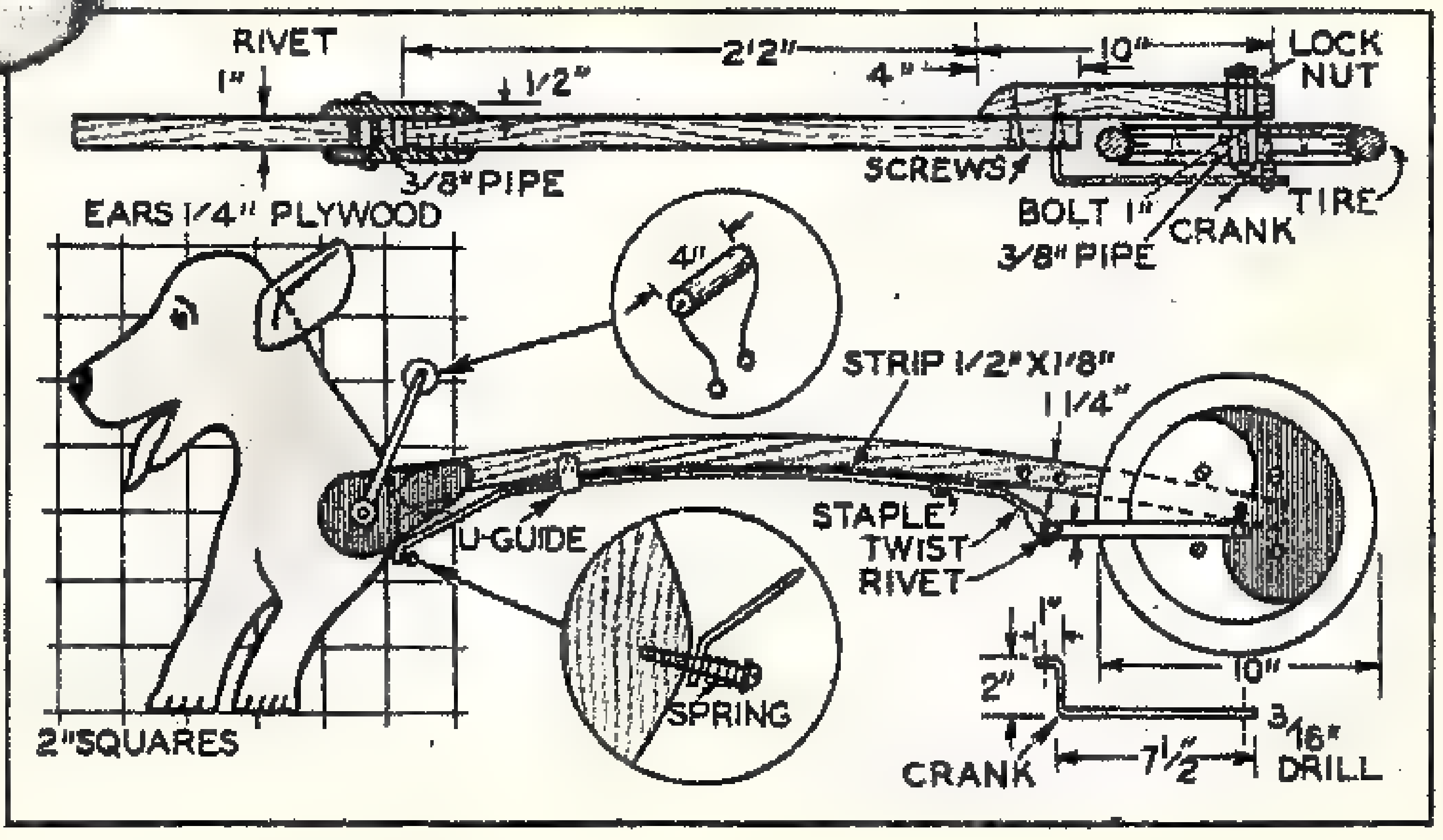
by Ralph T. Moore

A FAR cry from the "straddled broomstick" and certainly more interesting is "Jumping Jeff," a pup who nods his head back and forth when ridden. Children like colorful animal toys and an animated one like this is an added delight.

The pup is simplicity itself to construct and the material requirements are commonplace. First lay out the head on a piece of wood 14"x9"x⅞" and saw out on a jig saw. From ¼" plywood cut out the ears and nail and glue them in place as shown in the accompanying diagrams. The stem piece is laid out on a piece of wood 30"x4"x⅞", the curved shape is marked out by means of a thin strip of wood. The stem width is 1¼" and for this an old chair rocker serves admirably. Cut a straight piece 10"x⅞"x1¾" and fasten it with wood screws as shown to the curved piece. Drill the head piece and the stem with a ⅝" drill and into these holes drive a ⅞" length of ⅜" pipe to serve as bearings. Next cut two side hinge pieces from plywood 5"x2½"x ⅜" and drill these as shown. Nail and glue these to the end of the curved stem. Drill a 4" length of ⅞" dowel through the center with a $\frac{3}{16}$" drill and insert a 16" length of No. 10 iron wire. Bend this as diagram indicates and form eyes in the ends with pliers.

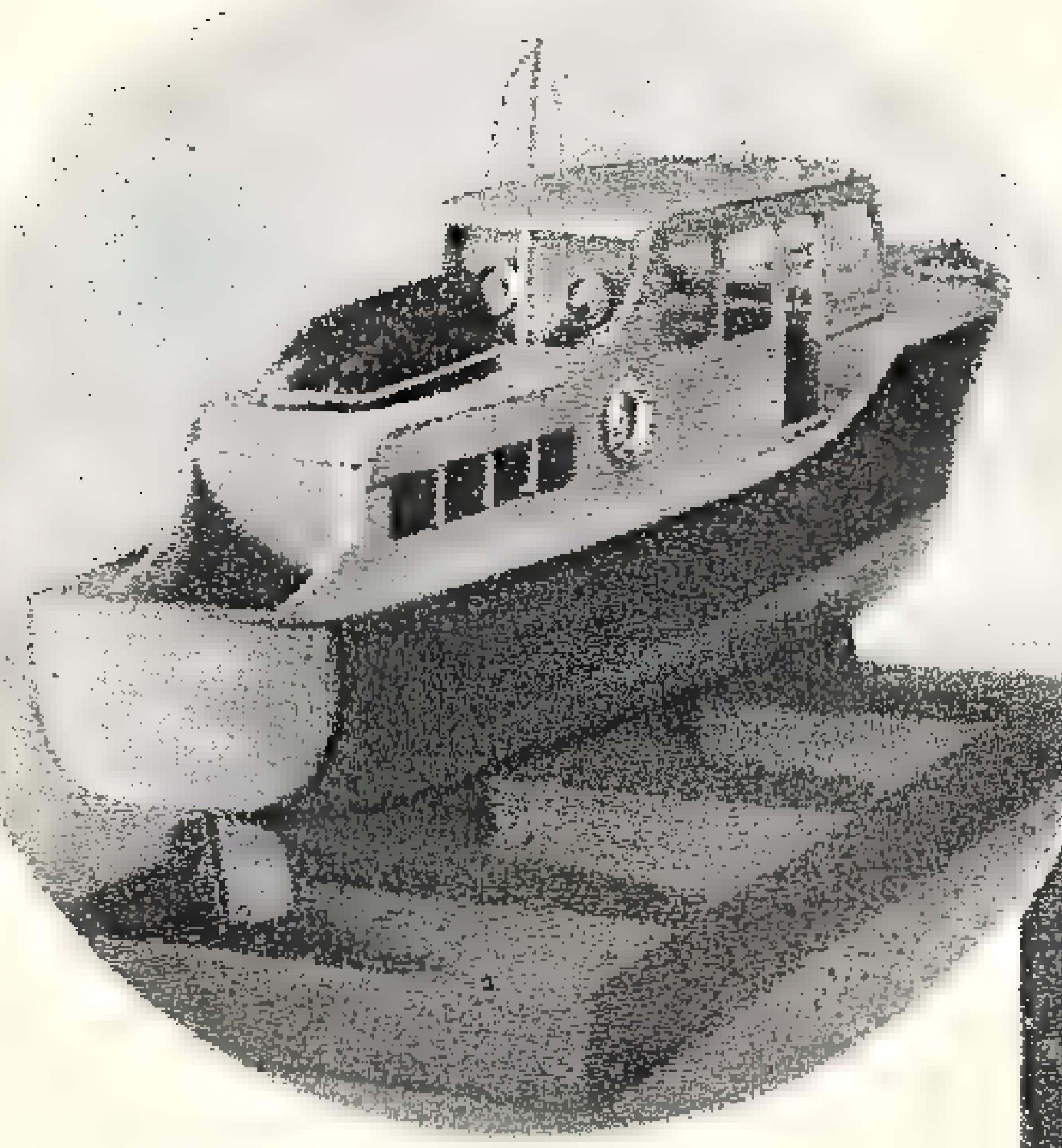
Obtain an old rubber tired carriage wheel

[*Continued on page* 126]

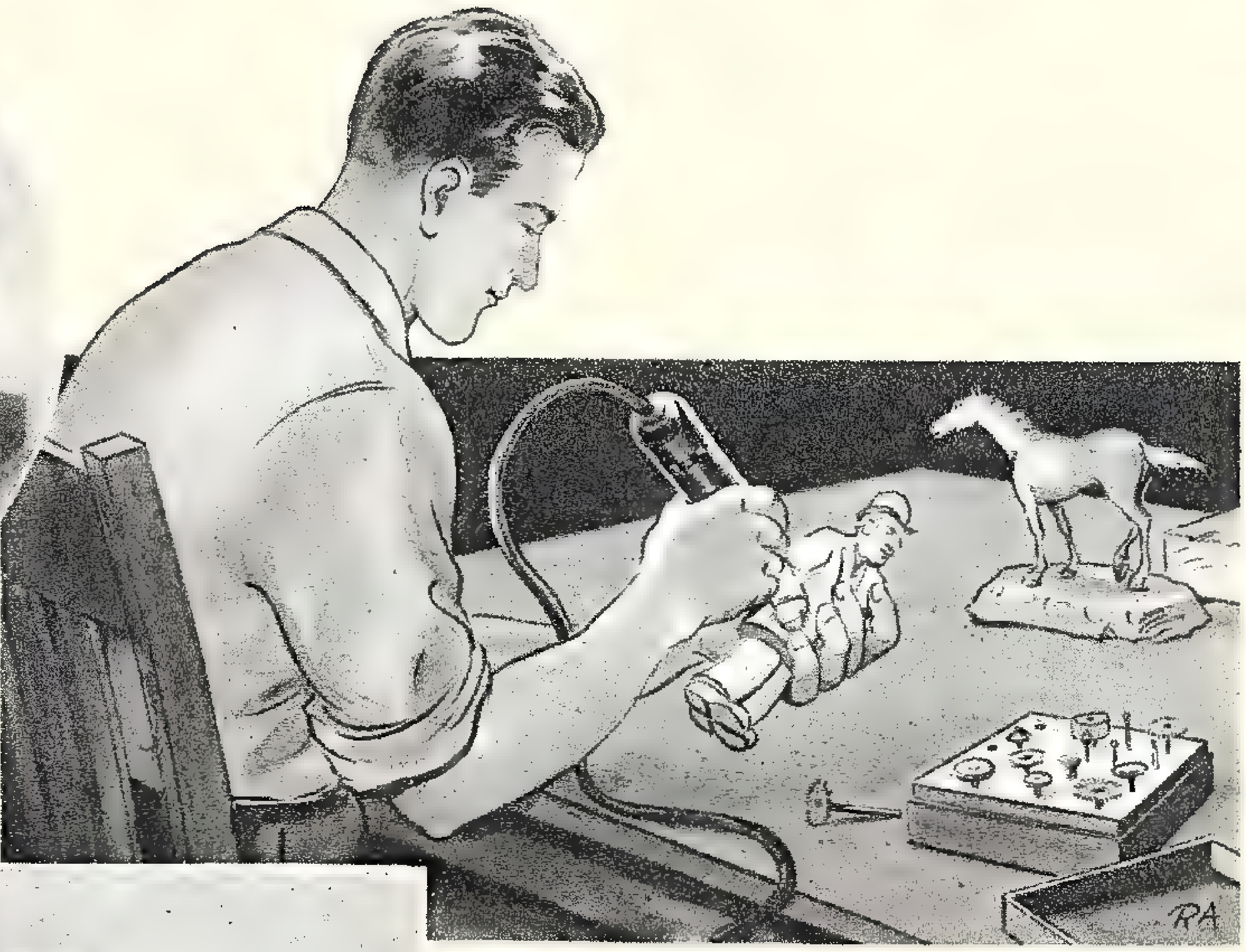


Construct "Jumping Jeff" according to specifications shown here. Dog's head is copied according to pattern pictured above. Tongue and ears are cut from plywood and nailed in place.

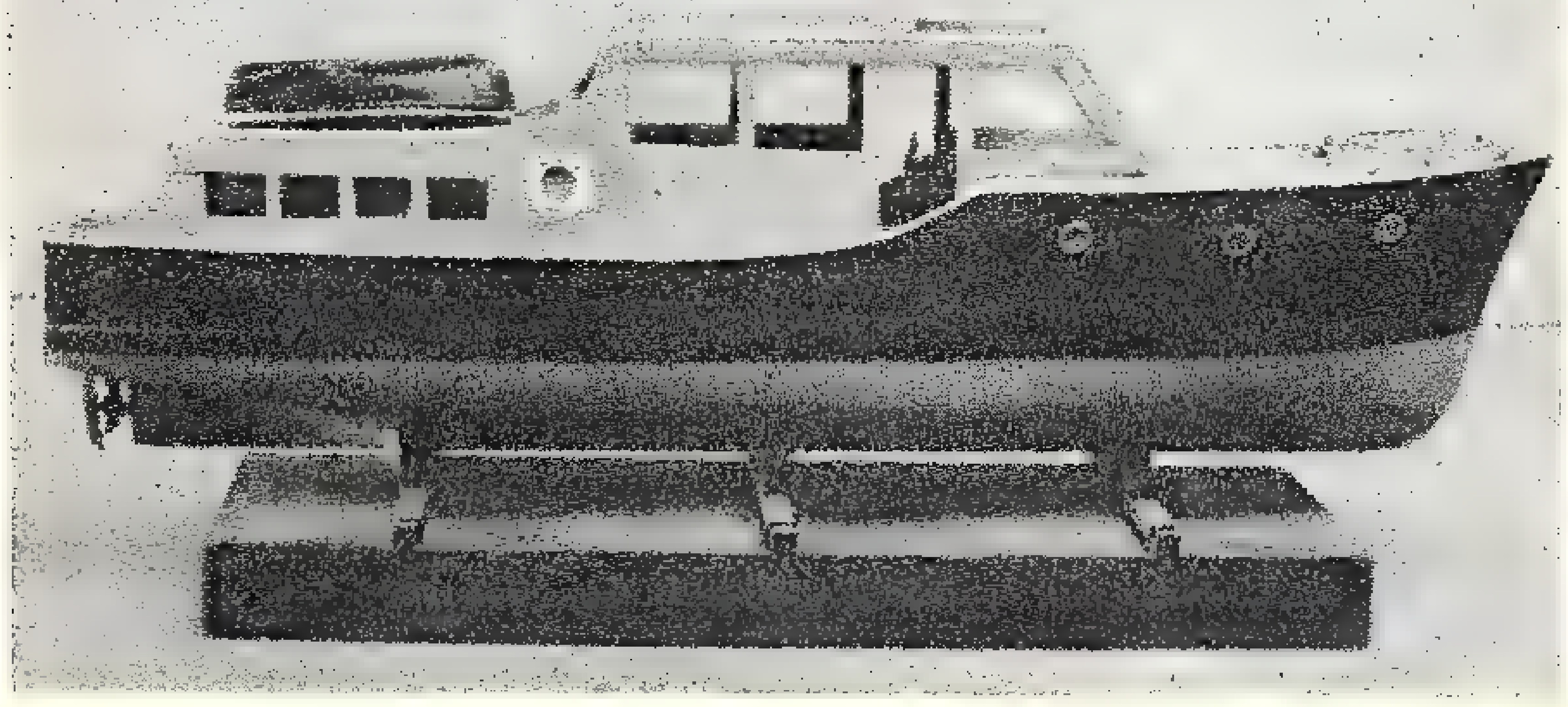
TINY HAND POWER GRINDERS



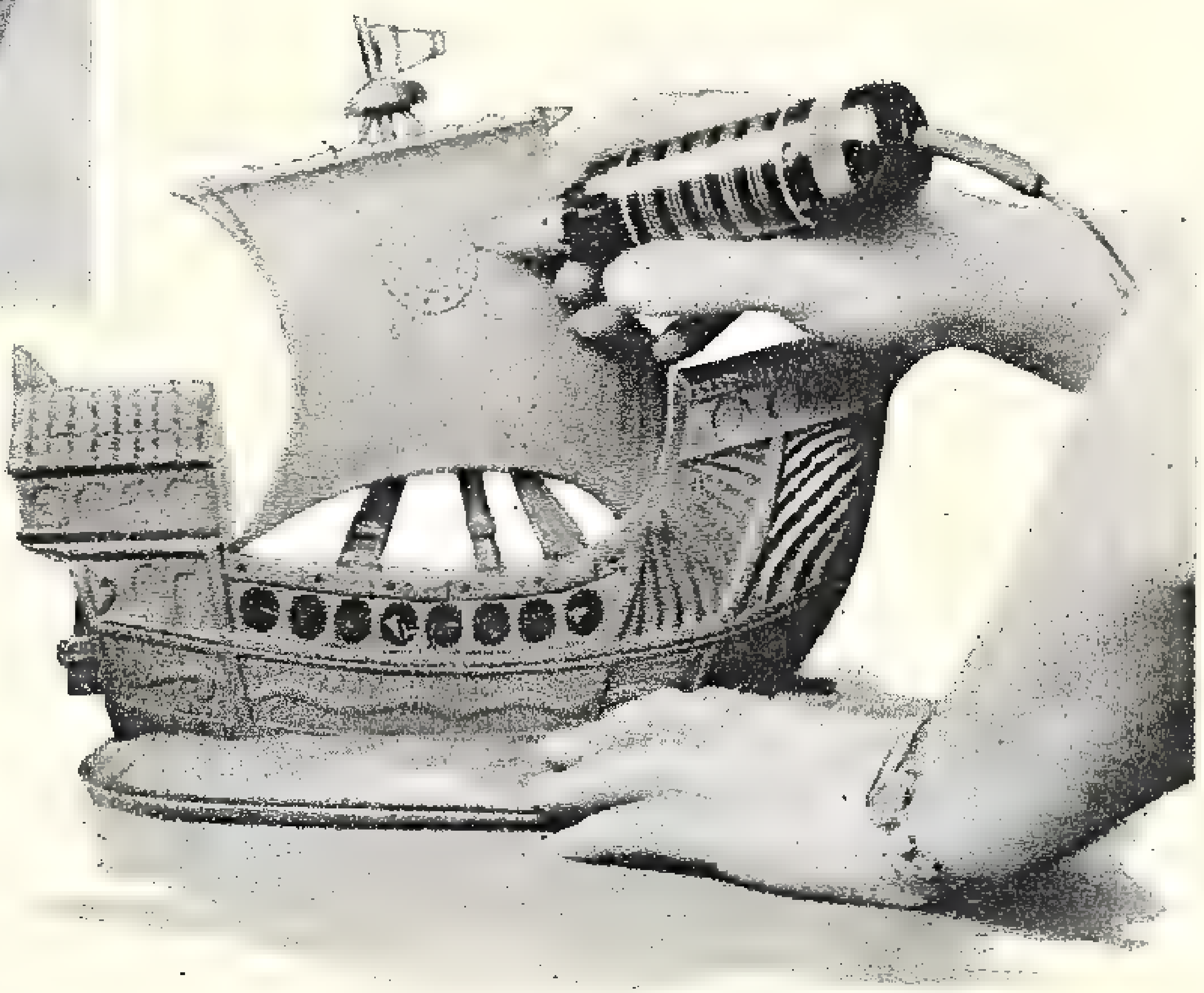
This model ship is just one of the many interesting projects that can be fashioned to exacting specifications by using a hand grinder for carving.



Interesting caricatures such as this one are easily carved from solid or laminated blocks of wood. The hand power grinder is provided with a chuck for taking numerous cutting, drilling and sanding tools.



Though it has all the marking of the professional modelmaker the miniature craft shown above was made by an amateur model fan. Some details and sanding were done by grinder.



This attractive ship lamp nearing the final stages of completion was carved from a block of walnut. The tiny decorative designs are being applied to the sail with a finishing bur tool.

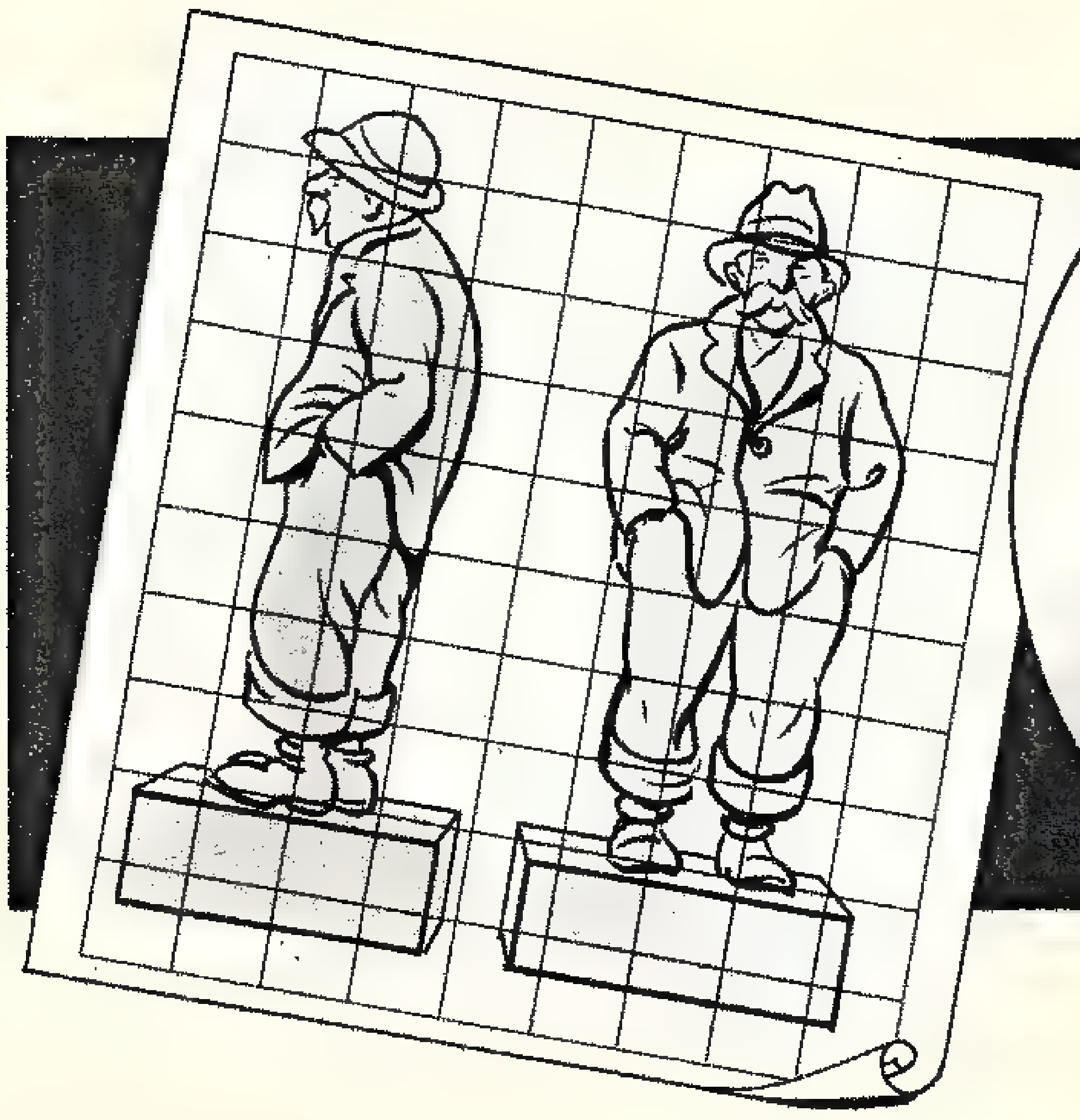
by A. T. Dalton

TO THE man who has a small workshop and limited room at his disposal yet who has a reasonable knowledge of wood-working and desire for carving there should be a very definite appeal in the new light weight portable high speed electric tools which allow a limitless variation of carving on wood, stone, cast resins and other material of this character.

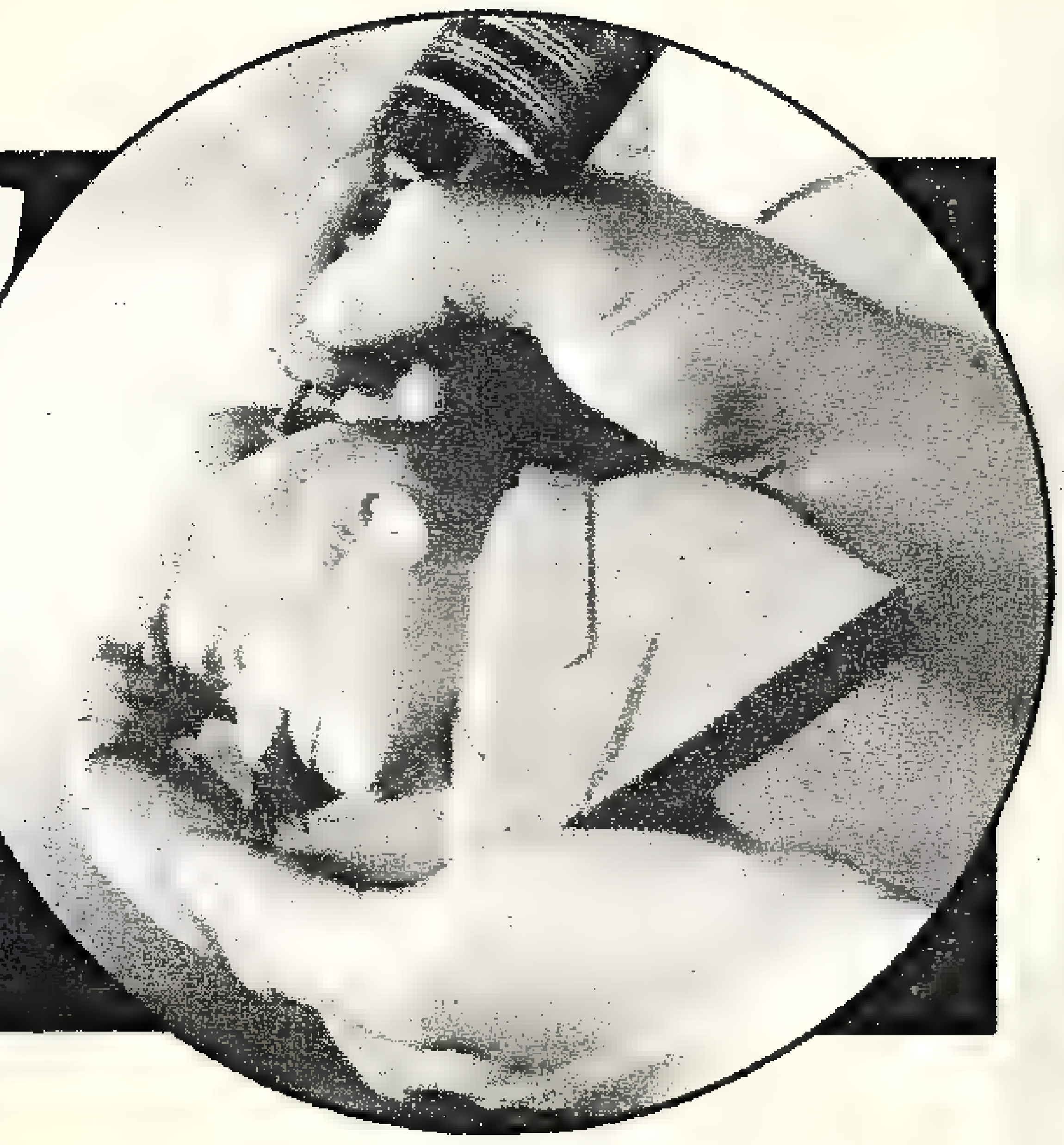
These high speed, light weight, electrically driven tools are conveniently shaped to fit the hand and owing to their perfect balance can be used over long periods of time without danger of fatigue. The secret of their great usefulness for carving lies in their high speed. A large variety of especially developed steel cutters are used with the unit and leave smooth uniform cut and does not have to be finished by sanding or other means. This class of tool is, primarily, a finishing tool and thus lends itself to finishing work that has been roughed out.

Another method most frequently used is to cut plywood to the appropriate figure desired and glue the plywood together to form a laminated block. For the craftsman who has not had previous experience in woodcarving it is suggested that the rough figure to be carved be cut from a solid block of wood by means of a hand saw.

SIMPLIFY MODEL CARVING



Carving wood caricatures is not difficult provided the figure is sketched in front and profile views on the block of wood. Comic strip characters also are excellent subjects for carving and are easily made.



A plaque like the one shown here of Will Rogers can be carved by first tracing picture on a flat wood block.

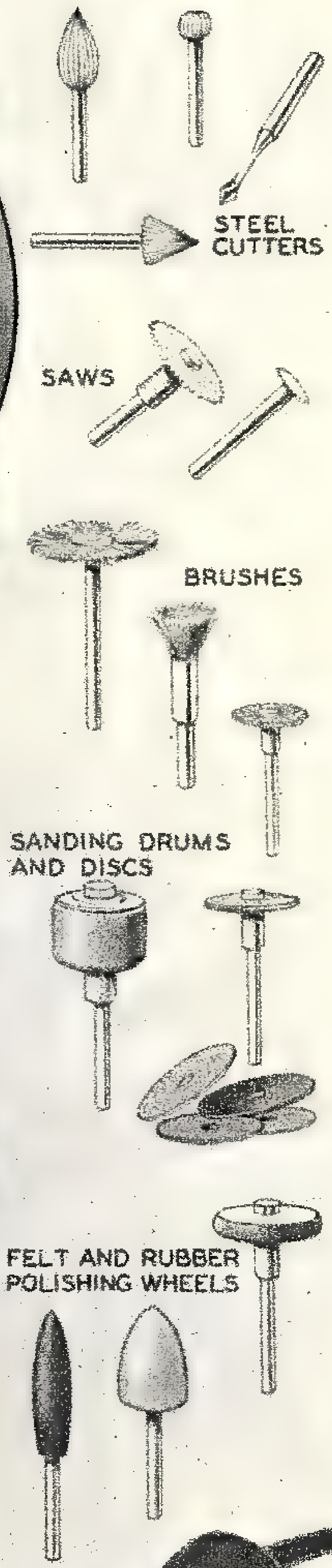
The figure shown in the accompanying illustrations makes an interesting project relatively simple for the amateur craftsman who wishes to try his skill with these new type of hand tools. There are no excessive details such as hands or background with this figure. The squared diagram shows the front and side views. Transfer these profiles to their respective positions on the wood-block which has been built up from plywood or, if you prefer, solid block of wood. The design can then be cut out with band saw, jig saw or with a hand saw.

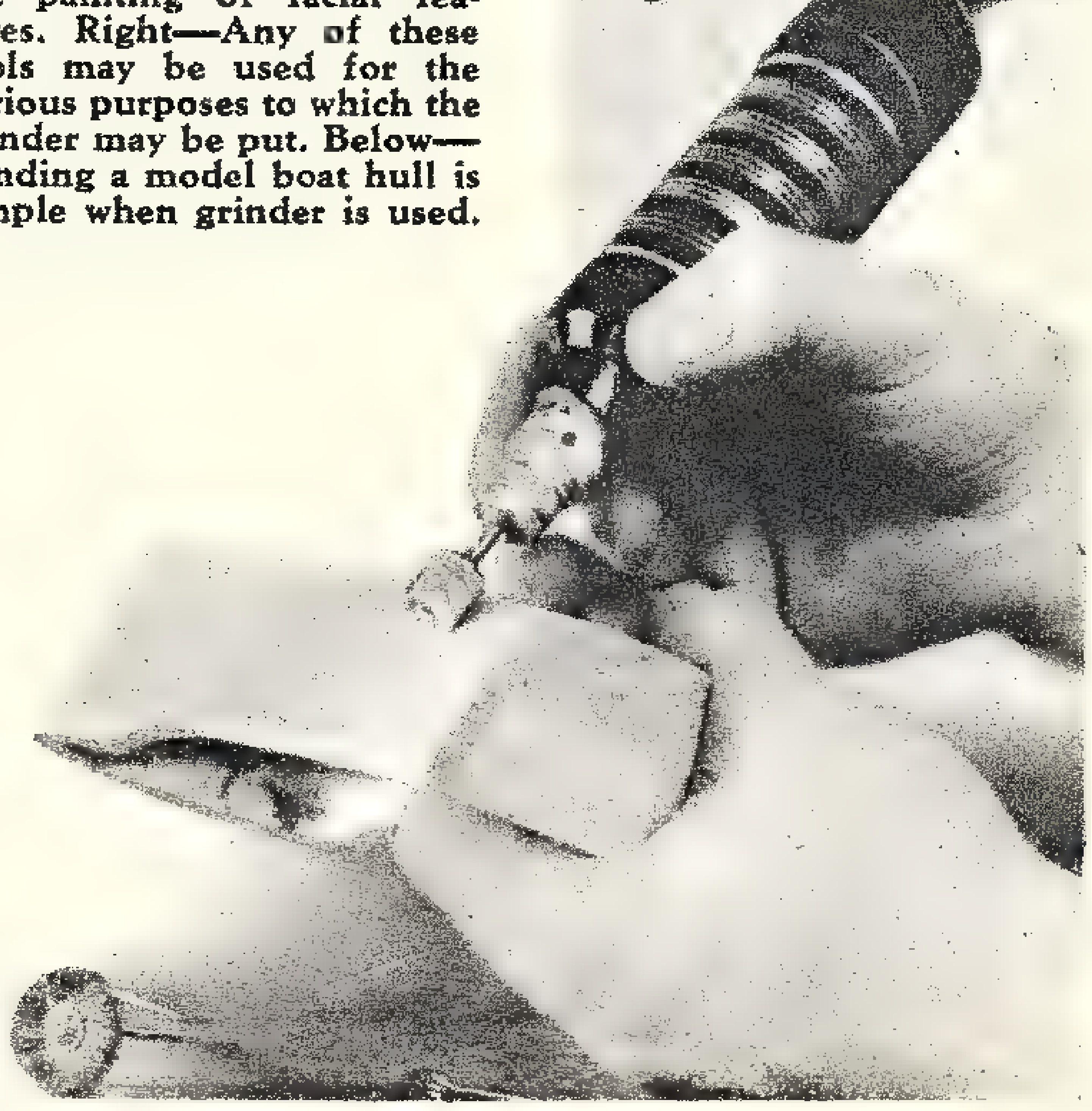
Using a rather large steel cutter rough out the design to the approximate figure following the outline given. Many craftsmen indicate the form that the model is to take by shading the design that has been drawn and transferred to the block. This often times serves as an excellent guide for bringing out different characteristics of the carving after it is actually underway.

It is difficult, and perhaps futile, to explain the step by step procedure to follow the modeling of the face for an example. With a design as simple as our first figure it is apparent that the cheeks, jaws and any portion of the fact are first cut with a relatively large steel cutter. Mustache, eyes, eye-brows and nose are formed with smaller steel cutters of the ball shape and flame shape, a large variety

[*Continued on page* 124]

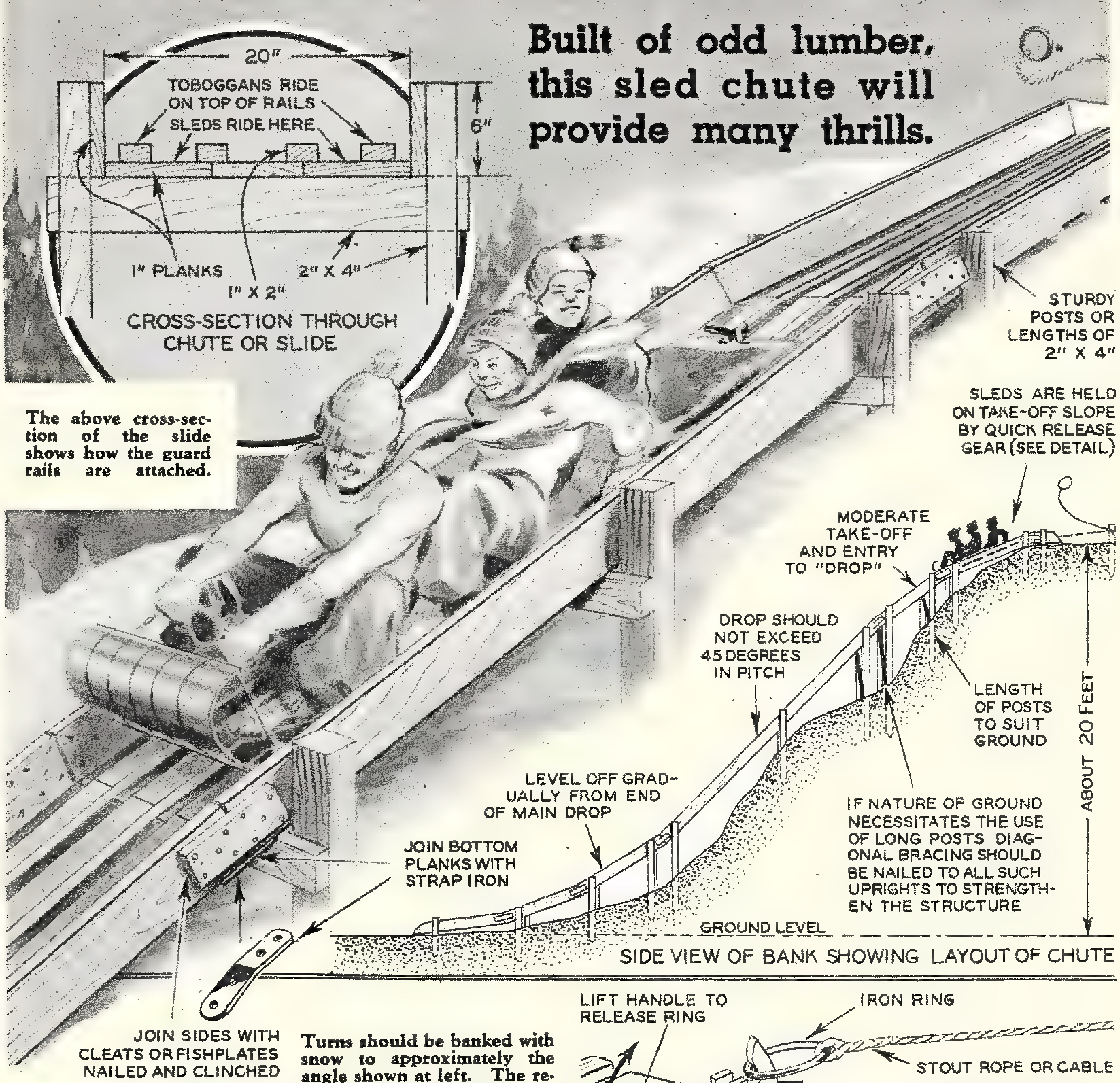
Carved caricatures can be finished in a very attractive manner by painting them with colored india inks, water colors or lacquers. A few camel's hair brushes will simplify this work especially in the painting of facial features. Right—Any of these tools may be used for the various purposes to which the grinder may be put. Below—Sanding a model boat hull is simple when grinder is used.





BUILD THRILLER TOBOGGAN SLIDE

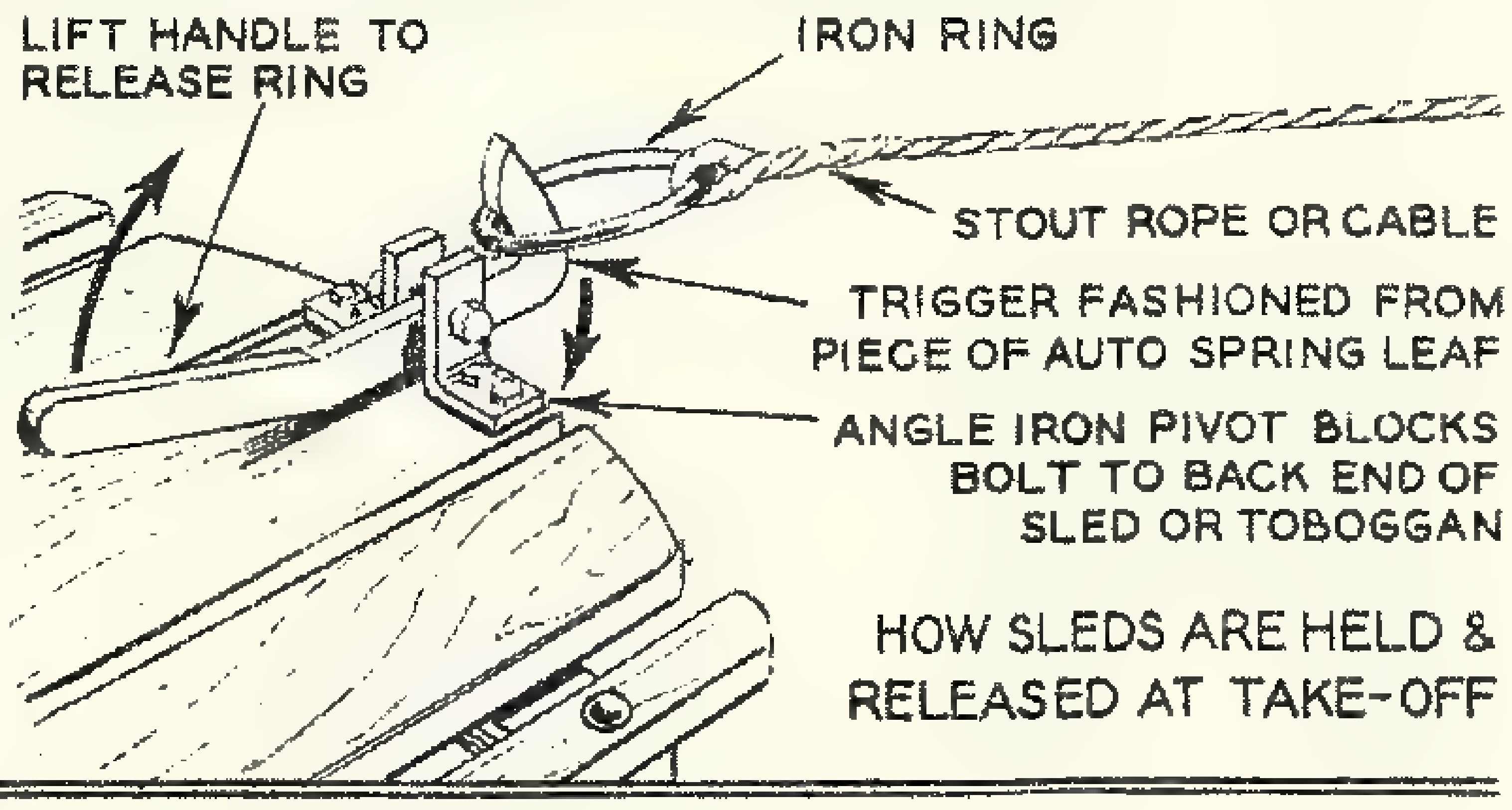
Built of odd lumber, this sled chute will provide many thrills.


20"
TOBOGGANS RIDE ON TOP OF RAILS
SLEDS RIDE HERE
6"
1" PLANKS
2" X 4"
1" X 2"
CROSS-SECTION THROUGH CHUTE OR SLIDE
STURDY POSTS OR LENGTHS OF 2" X 4"
SLEDS ARE HELD ON TAKE-OFF SLOPE BY QUICK RELEASE GEAR (SEE DETAIL)
MODERATE TAKE-OFF AND ENTRY TO "DROP"
DROP SHOULD NOT EXCEED 45 DEGREES IN PITCH
LENGTH OF POSTS TO SUIT GROUND
ABOUT 20 FEET
LEVEL OFF GRADUALLY FROM END OF MAIN DROP
IF NATURE OF GROUND NECESSITATES THE USE OF LONG POSTS DIAGONAL BRACING SHOULD BE NAILED TO ALL SUCH UPRIGHTS TO STRENGTHEN THE STRUCTURE
GROUND LEVEL
JOIN BOTTOM PLANKS WITH STRAP IRON
JOIN SIDES WITH CLEATS OR FISHPLATES NAILED AND CLINCHED

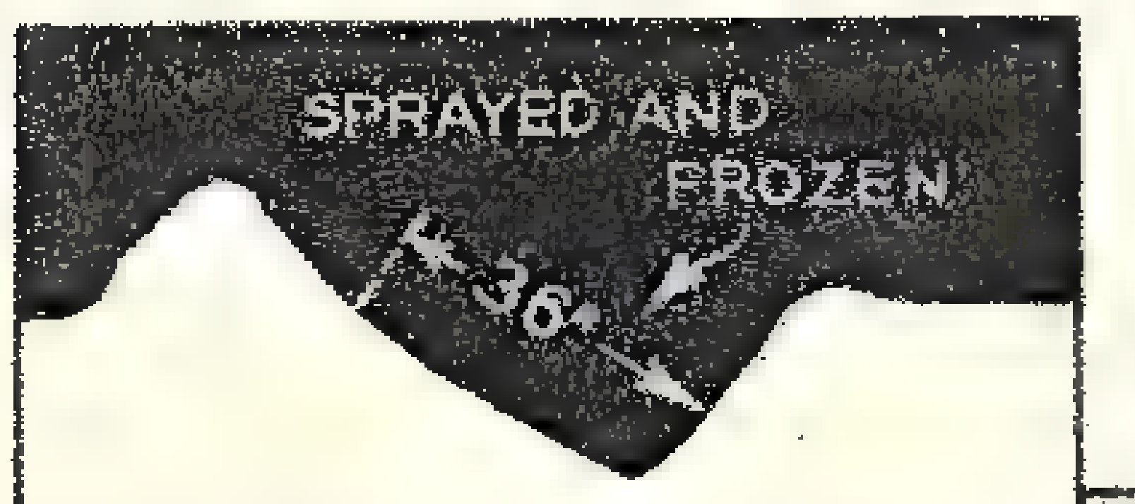
The above cross-section of the slide shows how the guard rails are attached.

SIDE VIEW OF BANK SHOWING LAYOUT OF CHUTE

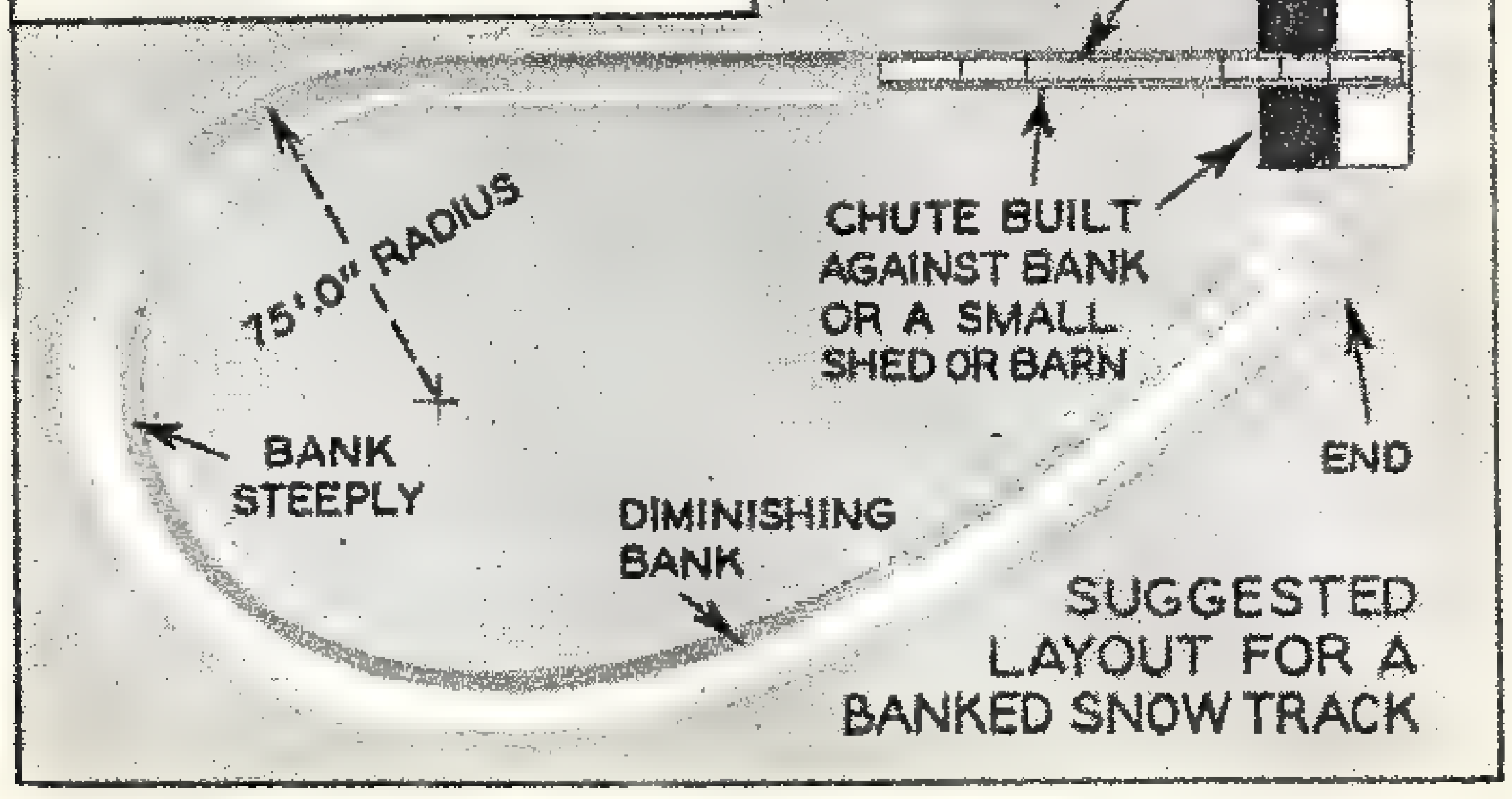
Turns should be banked with snow to approximately the angle shown at left. The release mechanism, at right, is simply a hook and iron ring. The hook is provided with a lever so that sled can be released after riders are seated.


LIFT HANDLE TO RELEASE RING
IRON RING
STOUT ROPE OR CABLE
TRIGGER FASHIONED FROM PIECE OF AUTO SPRING LEAF
ANGLE IRON PIVOT BLOCKS BOLT TO BACK END OF SLED OR TOBOGGAN

HOW SLEDS ARE HELD & RELEASED AT TAKE-OFF


SPRAYED AND FROZEN
36"

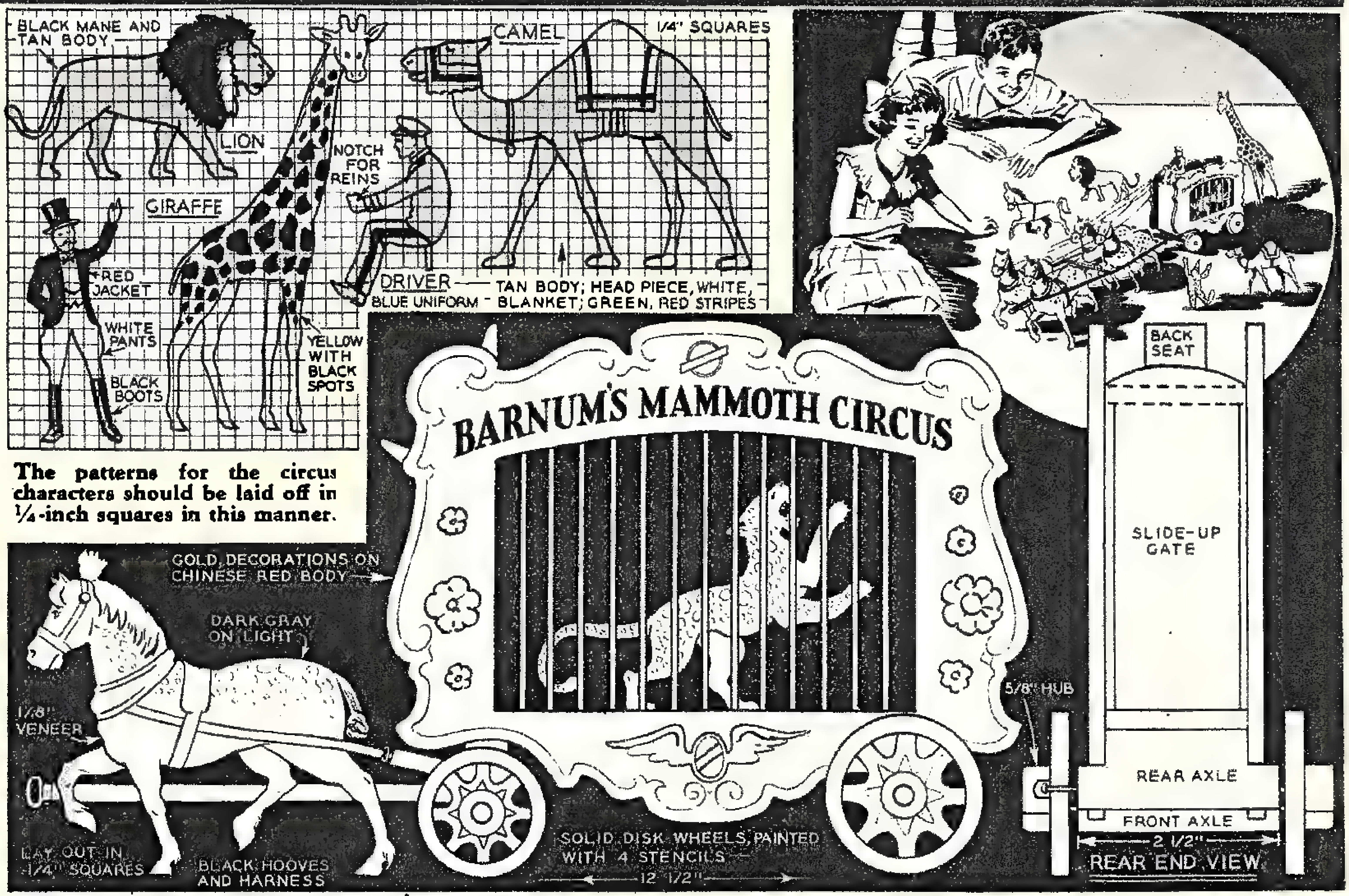
SECTION THRU SNOW TRACK ON CURVES.


WET DOWN AND ICED
CHUTE BUILT AGAINST BANK OR A SMALL SHED OR BARN
75'0" RADIUS
BANK STEEPLY
DIMINISHING BANK
END

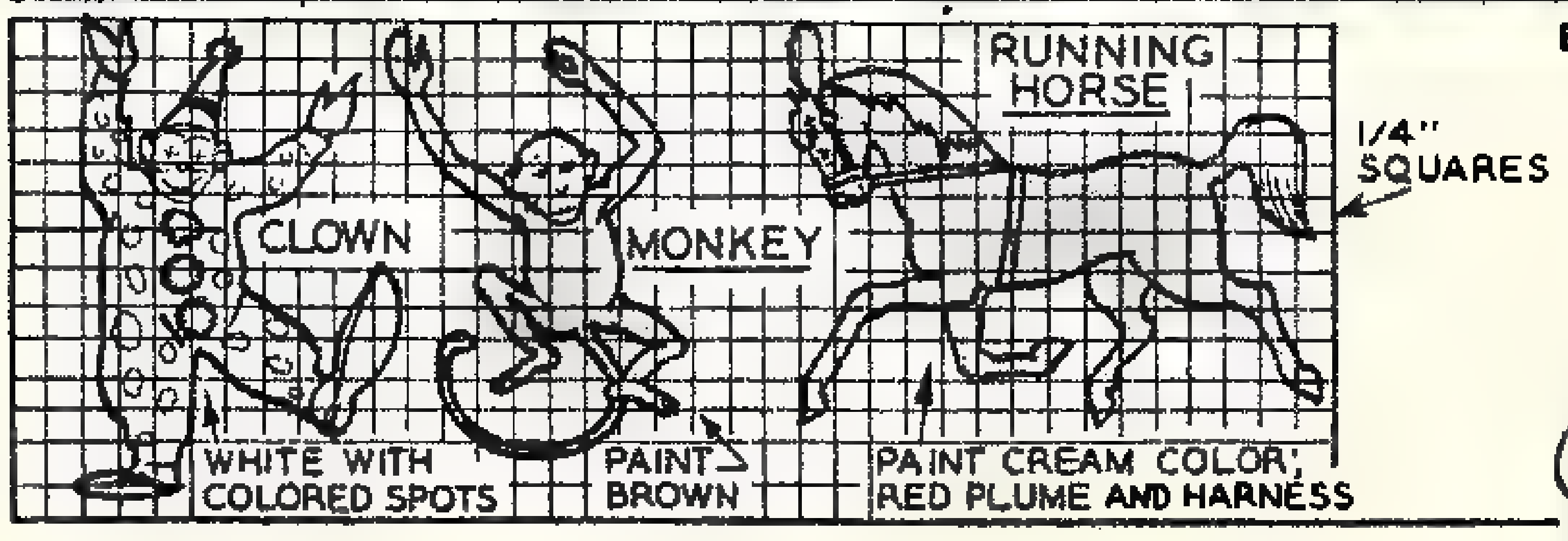
SUGGESTED LAYOUT FOR A BANKED SNOW TRACK

CONSTRUCTED mostly from sections of 2"x4" scrap stock this sled or toboggan slide will provide plenty of winter sport thrills. Install the slide on the side of a hill keeping the angle under 45 degrees as a safety measure. Lay out a banked track according to the suggested layout shown so that you return to the starting point. A catch is provided so that the toboggan can be attached to the chute while riders are taking their places.

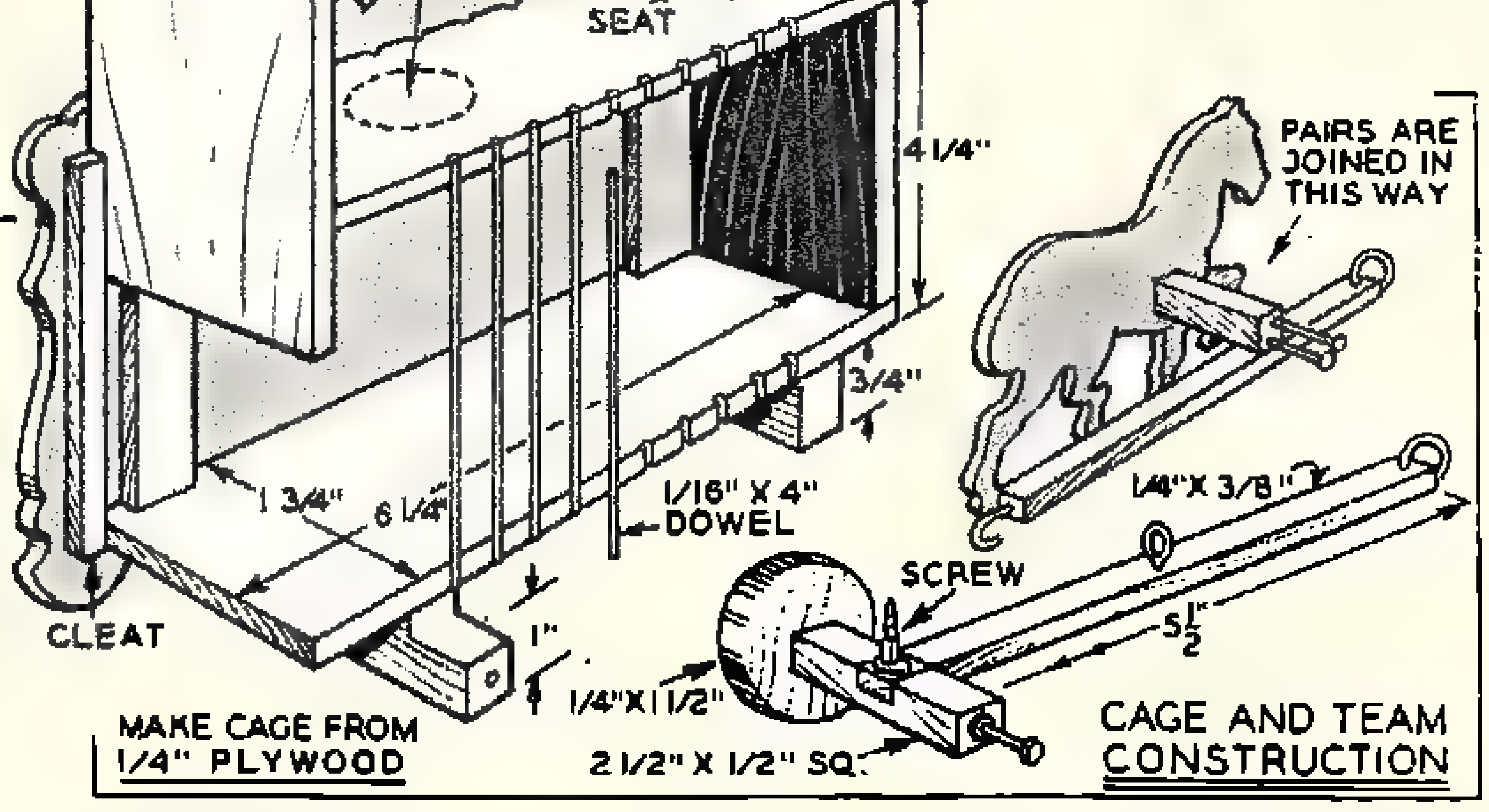
A CHRISTMAS CIRCUS FOR KIDDIES


BLACK MANE AND TAN BODY
LION
GIRAFFE
CAMEL
1/4" SQUARES
NOTCH FOR REINS
RED JACKET
WHITE PANTS
BLACK BOOTS
YELLOW WITH BLACK SPOTS
DRIVER
BLUE UNIFORM
TAN BODY; HEAD PIECE, WHITE, BLANKET; GREEN, RED STRIPES
BARNUM'S MAMMOTH CIRCUS
GOLD DECORATIONS ON CHINESE RED BODY
DARK GRAY ON LIGHT
1/8" VENEER
LAY OUT IN 1/4" SQUARES
BLACK HOOVES AND HARNESS
SOLID DISK WHEELS, PAINTED WITH 4 STENCILS
12 1/2"
5/8" HUB
BACK SEAT
SLIDE-UP GATE
REAR AXLE
FRONT AXLE
2 1/2"
REAR END VIEW

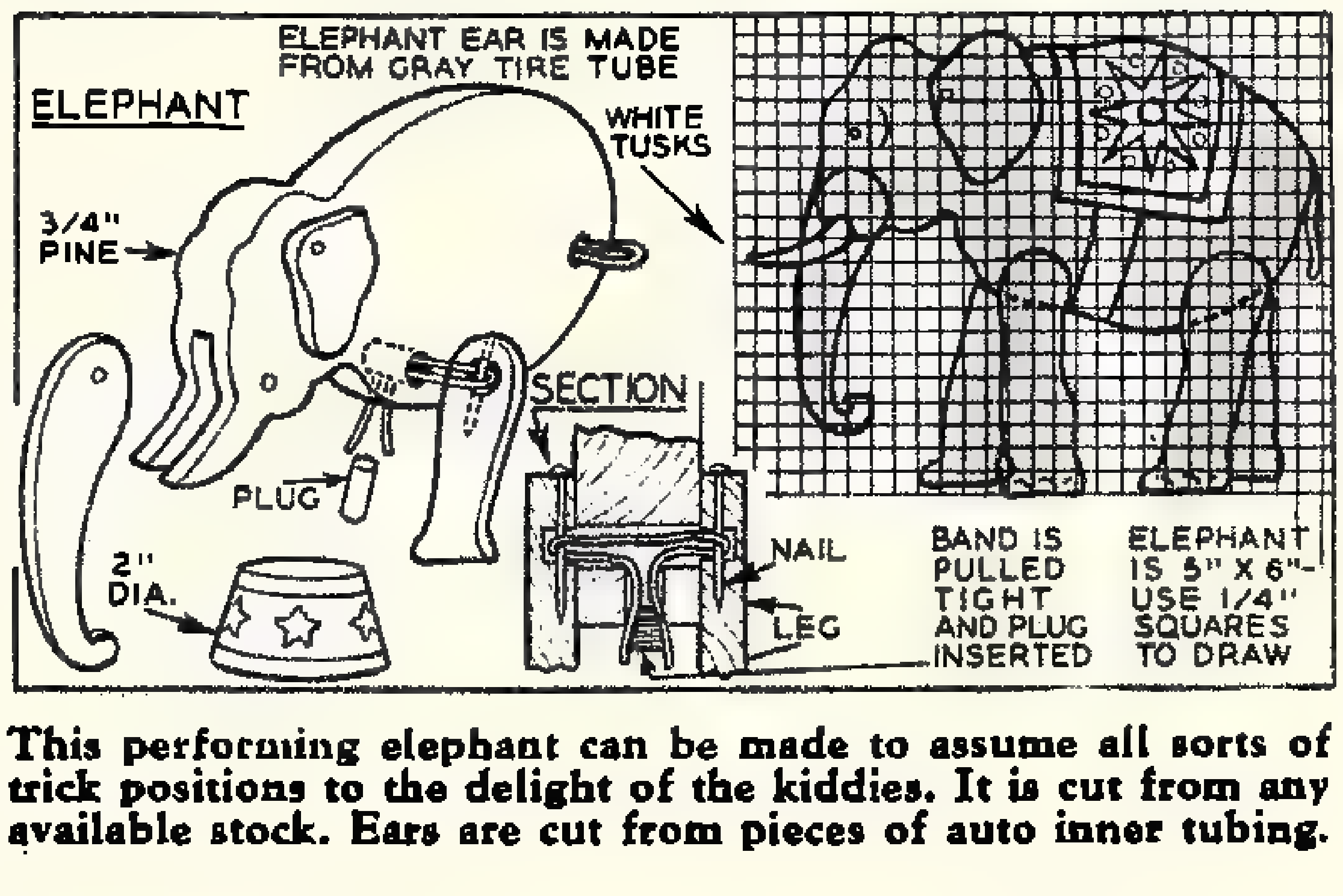
The patterns for the circus characters should be laid off in ¼-inch squares in this manner.


RUNNING HORSE
1/4" SQUARES
CLOWN
MONKEY
WHITE WITH COLORED SPOTS
PAINT BROWN
PAINT CREAM COLOR; RED PLUME AND HARNESS

Make the circus wagon according to dimensions given above. Construction is of plywood with decorations applied with stencil designs.


BACK SLIDE DROP
CUT HOLE FOR GIRAFFE
SEAT
4 1/4"
3/4"
1 3/4"
6 1/4"
1/16" X 4" DOWEL
1"
CLEAT
MAKE CAGE FROM 1/4" PLYWOOD
1/4"X 1 1/2"
2 1/2" X 1/2" SQ.
SCREW
5 1/2
1/4" X 3/8"
PAIRS ARE JOINED IN THIS WAY
CAGE AND TEAM CONSTRUCTION

Applicator dowels as used by doctors make excellent bars for the wild animal cage. A hole in the roof allows the giraffe to protrude his neck. Assemble teams according to diagram.


ELEPHANT
ELEPHANT EAR IS MADE FROM GRAY TIRE TUBE
WHITE TUSKS
3/4" PINE
SECTION
PLUG
2" DIA.
NAIL
LEG
BAND IS PULLED TIGHT AND PLUG INSERTED
ELEPHANT IS 5" X 6" - USE 1/4" SQUARES TO DRAW

This performing elephant can be made to assume all sorts of trick positions to the delight of the kiddies. It is cut from any available stock. Ears are cut from pieces of auto inner tubing.

THIS colorful little circus can be built with a scroll saw and paint brush, and is designed for simplicity of construction. Once the bristol-board patterns are made a dozen units can be run off in a short time. Profiles of animal cage, draft horse and driver appear in center illustration. The squared diagram supplies all of the dimensions for the smaller figures which should be cut from thin plywood, or ⅛" veneer. Quarter-inch plywood is used for the wagon and the wheels, which are solid disks of the sizes given. A quantity of these can be cut on the scroll saw by stacking several pieces of plywood and tacking them together. Four stencils are required for the painting—a red rim, two sizes of 8-pointed stars representing the spokes and another for the black area between the spokes. The cage is painted red with gold decorations. It is best to paint all parts before assembling. The

[*Continued on page* 130]

COMPLETING the

Authentic in every detail this miniature of the famous Mayflower can be built by anyone handy with tools. This final installment covers painting and rigging.

by Erling W. Eklof

PART III

HAVING completed all hull and cabin details on the model *Mayflower* as described in the November and December, 1936, issues of MODERN MECHANIX HOBBIES AND INVENTIONS final work on the painting and sail rigging of the ship may be started. In these, the final stages of your model extreme care should be exercised in painting and assembling the sails and their rigging so as to follow out the authentic details as much as possible.

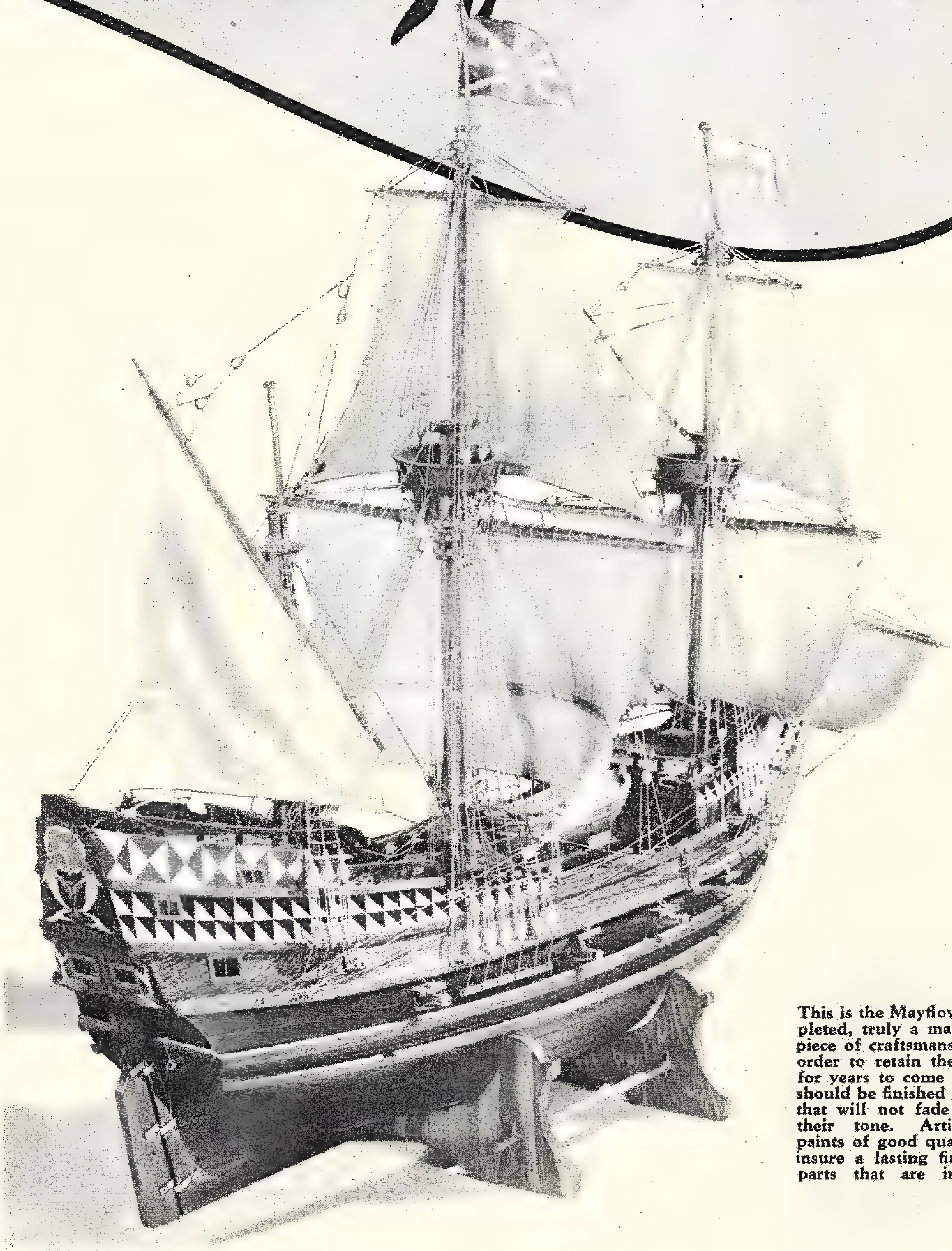
For painting the model, you will need at least one small sharply pointed brush to get into the small places and one flat ½-inch chisel shaped brush. You will also need one can of light oak stain and one can dark mahogany. To get the desired shades mix these two stains in varying proportions. Blue, white and black enamel and varnish will be needed as will tubes of oil paint in yellow ochre, Indian red, raw sienna and dark green.

Now you can start the decks. You want a light natural woody color. Get this by using just a touch of dark mahogany in light oak stain. Don't let it get too dark. You want some contrast between the decks and deck fittings which will run to a little darker than medium brown. Make the inside of the bulwarks a little darker than the decks, and the timberheads a shade darker with railings and steps quite dark. You will find by rubbing a little Indian red on the steps, ladders and rails that they will get a slightly worn appearance as if human feet and elbows had rubbed off some of the finish.

The outside of the bulwark and wales is a rich brown chestnut color. The channel between the lower wales is black with Indian red brushed in and under the beak and trail boards some musty dark green. Below the wales, stain the hull dark brown. Rub some yellow ochre along under the water line where the hull has its greatest beam. Rub or brush in dark green under the counter and under her belly coming up in close to the stem. Blend in these colors as if worn in by the ravages of time. On the trail boards and rails at the beak the conventional design of the time in black and white and blue and white should be carefully painted on. The same applies to the stern castle sides. I chose blue because it is a symbol of water and the sea; also designating faith and hope which is particularly appropriate to the pilgrim ship. Over the design, rub in a few light rusty stains; just enough to make it appear old. Paint a fine thin red line on the upper edge. Make the masts and yards a medium reddish brown, the panels in the doors black. The indentations on the fluted capstan and the top of the capstan are black. The cleats are light and worn. Paint the long boat the same as the hull of the ship. The thwarts and sail locker are a natural wood color. Stain the oars and mast. The wales of the long boat should be light.

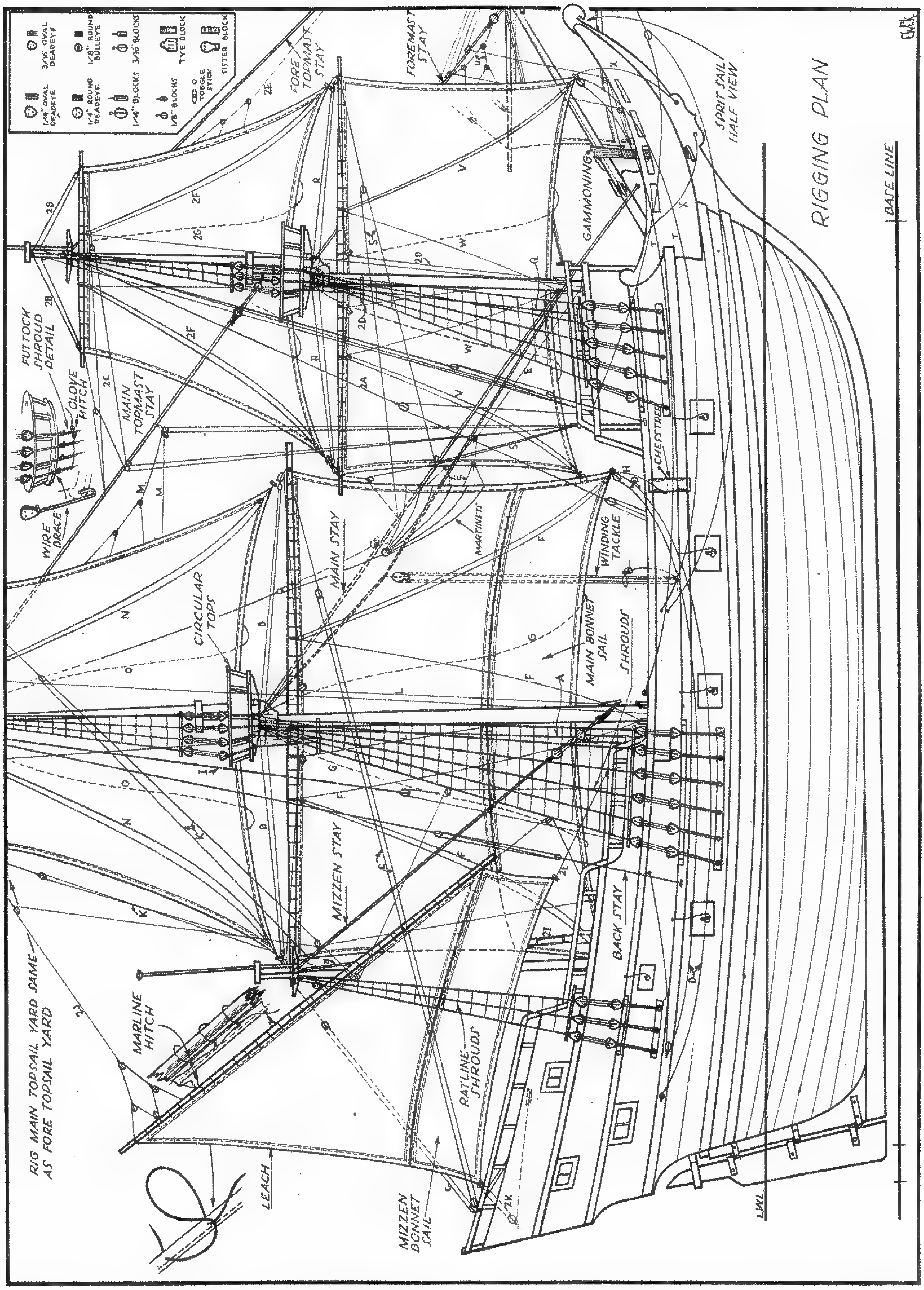
In regard to the design on the stern of the *Mayflower*, you need not adhere to my origination providing you have an appropriate design of your own. May I describe the symbolic significance of the design. The flower at the top of the design is a semi-heraldic rose, the rose being, as you perhaps know,

MODEL Mayflower

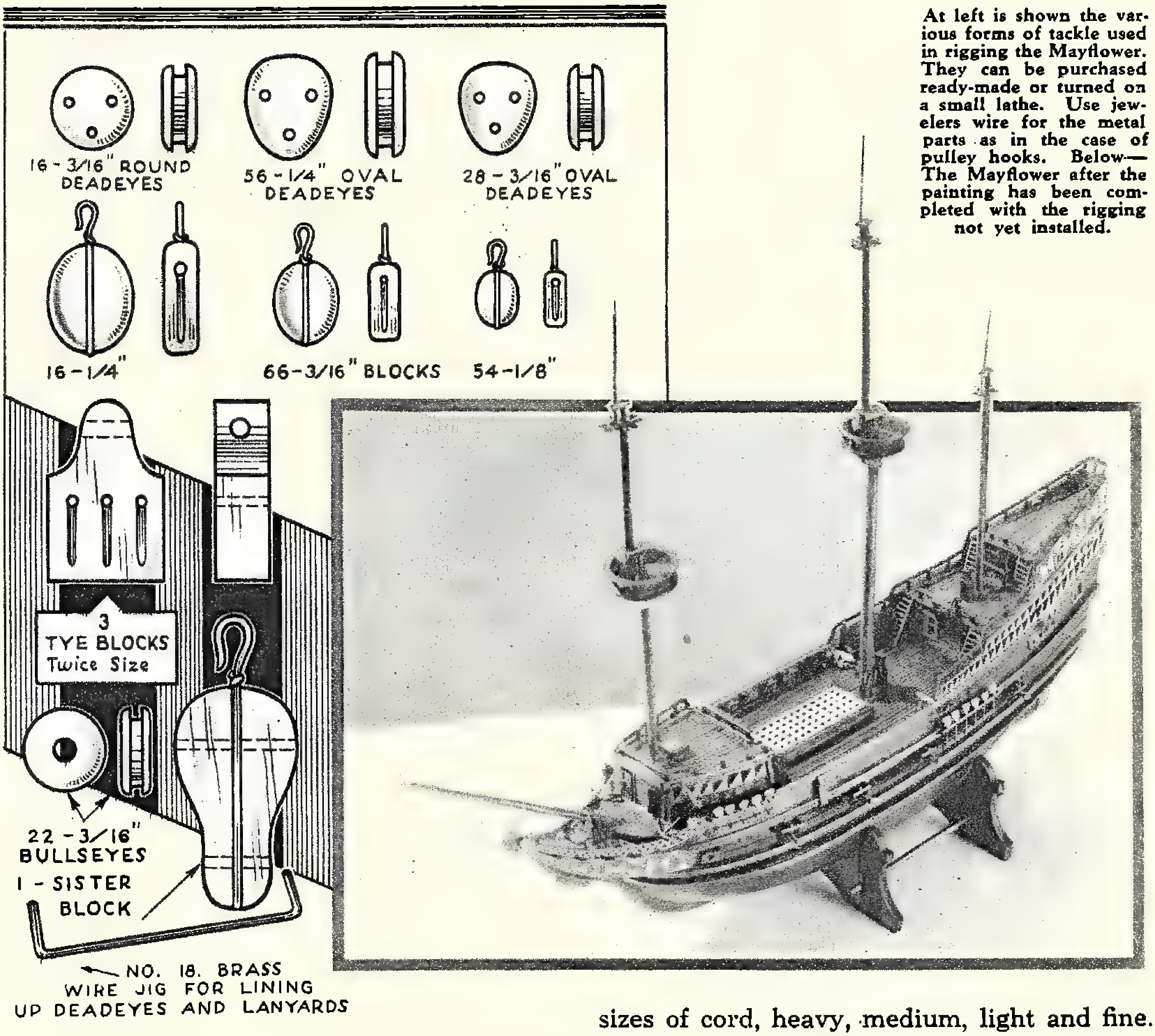


This is the Mayflower completed, truly a magnificent piece of craftsmanship. In order to retain the beauty for years to come the ship should be finished in stains that will not fade or lose their tone. Artists' oil paints of good quality will insure a lasting finish for parts that are in color.

PLAN Simplifies the RIGGING of Mayflower Model


1/4" OVAL DEADEYE
3/16" OVAL DEADEYE
1/4" ROUND DEADEYE
1/8" ROUND BULLEYE
1/4" BLOCKS
3/16" BLOCKS
1/8" BLOCKS
TYE BLOCK
TOGGLE STICK
SISTER BLOCK
FORE TOPMAST STAY
FOREMAST STAY
SPRIT SAIL HALF VIEW
RIGGING PLAN
BASE LINE
GAMMONING
FUTTOCK SHROUD DETAIL
CLOVE HITCH
MAIN TOPMAST STAY
WIRE BRACE
CHESSTREE
WINDING TACKLE
MARTINETS
MAIN STAY
CIRCULAR TOPS
MAIN BONNET SAIL
SHROUDS
MIZZEN STAY
BACK STAY
MARLINE HITCH
RATLINE SHROUDS
RIG MAIN TOPSAIL YARD SAME AS FORE TOPSAIL YARD
LEACH
MIZZEN BONNET SAIL
LWL

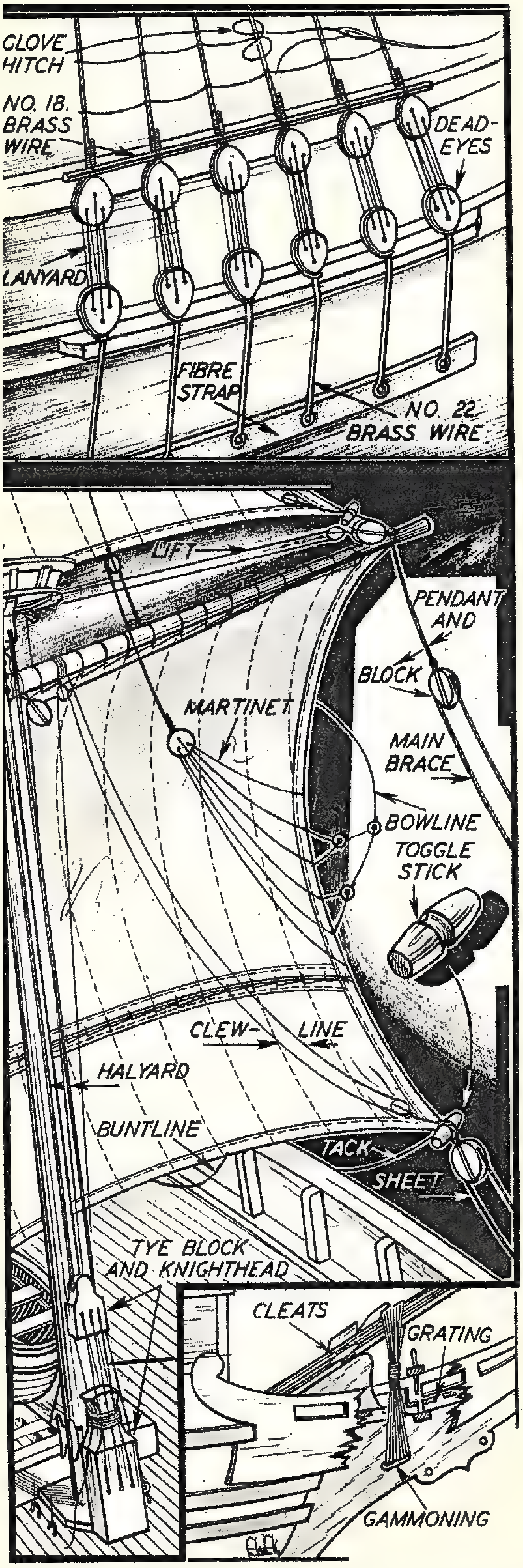
In rigging model be sure to use grade of cord called for, heavy, light or medium linen cord is used in the work. The linen cord may be stained with oil color to add an authentic touch. Needle with closed end of head broken off and crocheting needle make handy rigging tools.



At left is shown the various forms of tackle used in rigging the Mayflower. They can be purchased ready-made or turned on a small lathe. Use jewelers wire for the metal parts as in the case of pulley hooks. Below—The Mayflower after the painting has been completed with the rigging not yet installed.

the floral symbol of England. Since the *Mayflower,* as far as we know, was not in the King's service or owned by nobility, it seems reasonable that the pure heraldic rose would not be particularly significant. The dolphins, the symbol of the religious life and Resurrection is appropriate to the pilgrim ship and in addition is a sea ornament very often used. Paint them green with yellow bellies and fins. The ray-like background behind the rose represents the light and the new way to freedom. Paint the stripes alternately Prussian blue and dull carmen. The urn of earth representative of the humble characteristics of the pilgrims supports the flower and the dolphins. It is painted red with a gold wing design outlined with light green lines. The background behind the urn and around the dolphins may be painted Prussian blue or stained dark brown. The name *Mayflower* in red goes underneath.

Rigging your model is next and should be carefully done. For this you will want four sizes of cord, heavy, medium, light and fine. You will need 56 ¼-in. heart shaped deadeyes, 28 $\frac{3}{16}$-in. deadeyes heart shaped and 16 round $\frac{3}{16}$-in. deadeyes, 22 $\frac{3}{16}$-in. bull's-eyes, 54 ⅛-in. single blocks and 66 $\frac{3}{16}$-in. single blocks, 16 ¼-in. single blocks, 3 tye blocks and 1 sister or fiddle block. You can use round deadeyes in place of the heart shaped as perhaps they are a bit easier to make. Boxwood or gumwood is used for deadeyes and blocks. Round deadeyes and bull's-eyes can be turned on a lathe in this manner, using a dowel stick of the required size and about 8 in. long. With a special tool about the thickness of an ordinary table knife, cut a groove almost to the center, leaving enough wood to prevent it from breaking off too easily, then cut the slight groove that goes around the deadeye. Cut deep again to form the other side of the deadeye. Repeat for the next deadeye, remove from the lathe and cut the separate deadeyes apart. Make a little tube or cup to hold two or three deadeyes, one above the other. Drill the three holes required. Bull's-eyes can be made the



The topmost illustrations show the Lanyard threading and dead-eye mounting arrangements. Sail rigging is simplified by lower diagrams showing how linen threads fasten to tackle.

same way. Drill one hole in place of three. By flattening the sides of the dowel, blocks may be made in the same fashion. Drill one hole near one end of the block. In the event that you have no lathe to use, you can reverse the process, drilling the holes in the end of the dowel, then grooving and cutting off with a hand scroll saw. Very fine blocks and deadeyes can also be purchased from ship model supply houses. It is essential that deadeyes and blocks should not be used too large or the appearance of the whole model will be spoiled.

Concerning the sizes of cord for rigging, the heavy rigging used for shrouds will be No. 5 mercerized crocheting cotton. For the medium, No. 10; for the light, No. 40, and for the fine used for lanyards and ratlines, No. 60 serves very well. This may be obtained at any dry goods store. Dye the heavy, medium brown, and the medium cord, just a tint lighter. The light and fine cord numbers 40 and 60 respectively should be dyed a tan color, a shade darker than ecru. To do this, draw the cord through dye or stain of the desired shade. If you wish, you may use linen fish line which, outside of being stronger, has no particular advantage.

After having stepped the masts glue in the bowsprit and lash it down with the gammoning. Use the heavy cord for this. Throw a hitch around the bowsprit and slide it down to the cleat. The cord goes through the forward end of the slit in the cutwater from the port side to the starboard. Then up around the bowsprit from starboard to port for about eight turns. Wind the cord around each half of this lashing and secure it with a clove hitch so you will be able to wind about five turns around the whole of the lashing. Fasten the end with a good knot and the gammoning is completed.

Next come the chain plates. They are the straps that go around the deadeyes and secure them in their position just above the chain wales. They are made of No. 22 brass or aluminum wire. Bend the wire around the deadeye and make a twist to secure it and then below where it fastens to the hull, make a small eye in the wire to take a pin. Where the chain plates are secured to the hull, there is an iron strap (make this with red fibre) that follows the sheer line. Be careful to keep the deadeyes even.

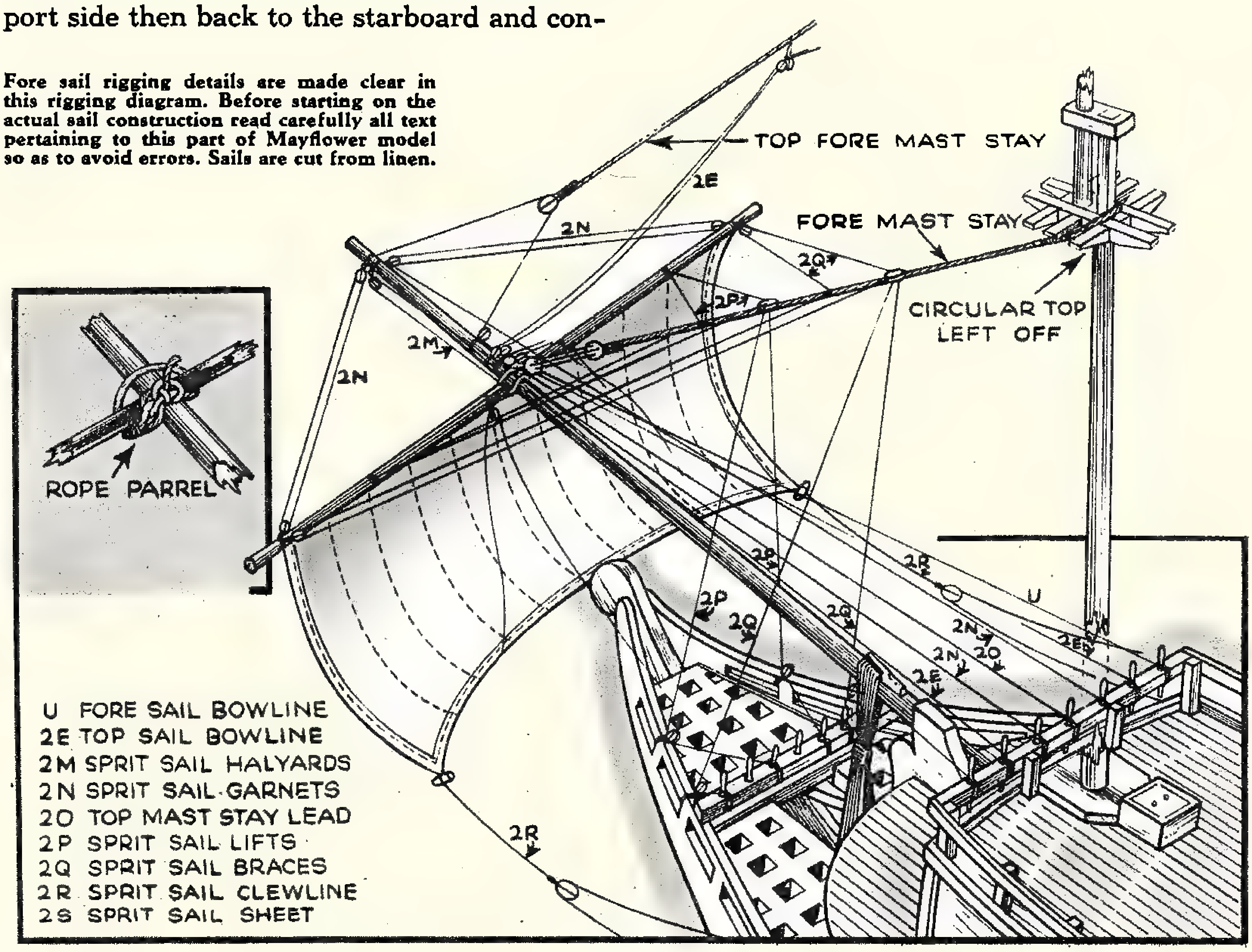
After you have all the chain plates and their deadeyes in place, take a piece of heavy cord and seize it around a ¼-in. deadeye. To aid in setting up the shrouds, make a U shaped sharp cornered form from No. 22 wire to hold the deadeyes about two of their lengths apart. Insert this wire form in the hole of a left hand deadeye on the chain wale and put the other end through the deadeye seized to the heavy cord. Now pass the cord up through the lubbers hole, around the mast and down through the lubbers hole on the same side, and seize a deadeye to its lower end, even with the first. Draw a lanyard of fine cord through these two deadeyes in this manner. First tie a knot in one end of an 8-in. cord. Reeve this through the right hand lower hole of the upper deadeye looking from the outside with the knot in back, then down to the upper right hand hole in the lower deadeye, then up to the middle hole of the upper deadeye, down on the outside to the corresponding hole in the lower deadeye, up again to the remaining hole in the upper deadeye, and down to the left hand hole in the lower deadeye and fasten with a clove hitch where the shroud is seized to the upper deadeye. Do not cut off the loose end as yet. Now take the wire form off of the first set of deadeyes and run the lanyards through them. Draw the deadeyes even and secure with clove hitches. Cut off the loose ends. Seize the two shrouds together directly under the cross trees. Do the same on the port side then back to the starboard and continue until all the lower main shrouds are on. Keep the mast in the central position, but leaning aft a little more than one part in thirty. When the main stays are put on, they will pull it forward to its correct position.

The fore and mizzen shrouds are done in the same method, but because of the odd numbers of the shrouds, they go around the masts and to the opposite side instead of in pairs on the same side.

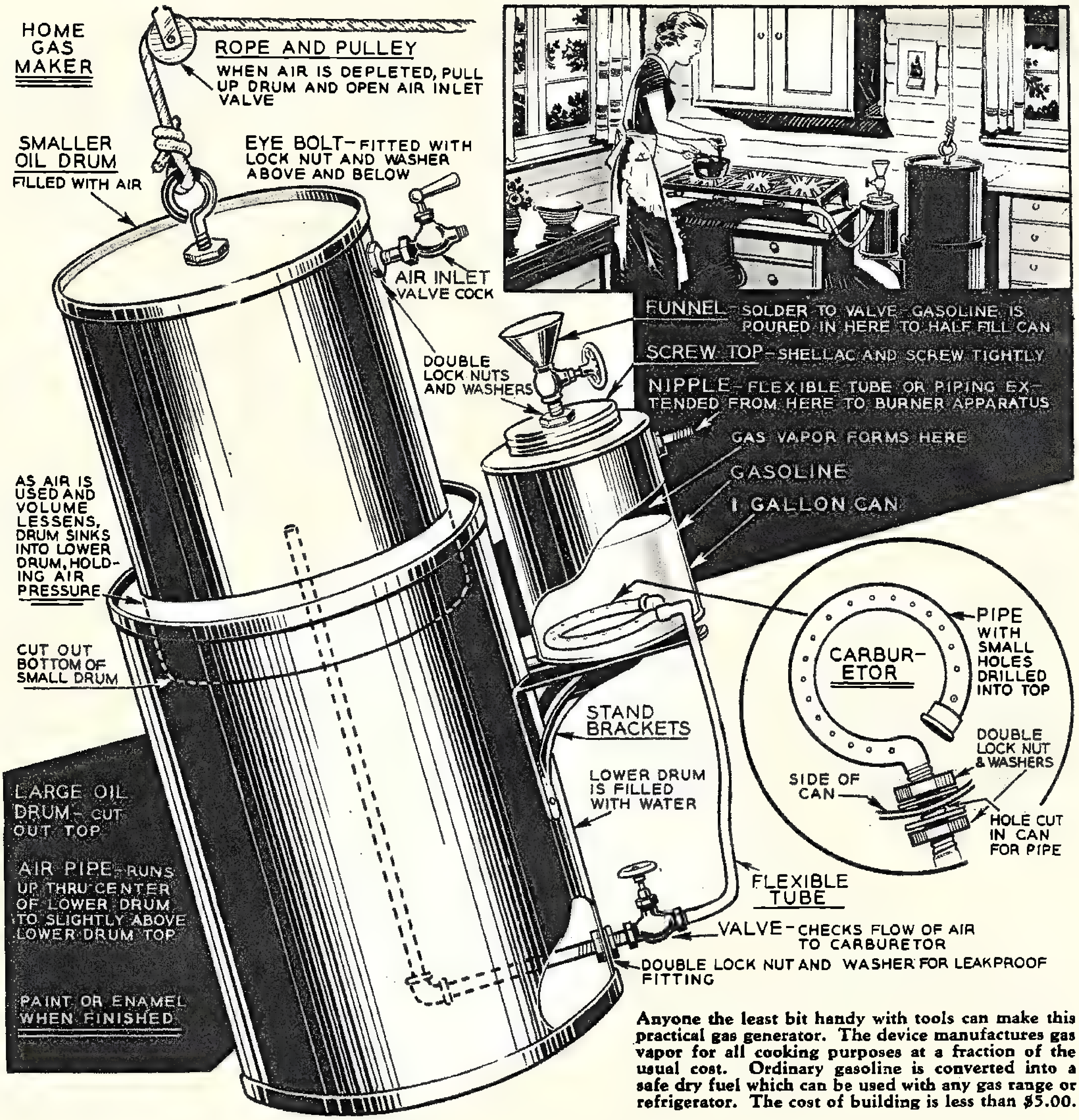
Let's get at the stays. Lay up three parts of heavy cord by fastening the three ends in something firm and twisting the other three ends with an ordinary hand drill. Two cords twisted similarly will serve as the mizzen stays. Saturate them with thin model aeroplane glue to keep them from unraveling. The main stay is double in the form of a strap. It goes up between the cross trees and around the mast; the other end goes through a hole in the stem. The whole stay is pulled together with a lanyard using the $\frac{3}{16}$-in. round deadeyes and passes on each side of the fore mast, the lanyard being situated immediately behind this mast. The fore stay is fastened by a lanyard, its lower deadeye lashed

[*Continued on page* 126]

Fore sail rigging details are made clear in this rigging diagram. Before starting on the actual sail construction read carefully all text pertaining to this part of Mayflower model so as to avoid errors. Sails are cut from linen.


TOP FORE MAST STAY
2E
2N
FORE MAST STAY
2Q
2P
CIRCULAR TOP LEFT OFF
2M
2N
ROPE PARREL
2R
2P
2Q
2Q
2R
U
2N
2E
2N
2O
2E
2R
U FORE SAIL BOWLINE
2E TOP SAIL BOWLINE
2M SPRIT SAIL HALYARDS
2N SPRIT SAIL GARNETS
2O TOP MAST STAY LEAD
2P SPRIT SAIL LIFTS
2Q SPRIT SAIL BRACES
2R SPRIT SAIL CLEWLINE
2S SPRIT SAIL SHEET

GENERATOR MAKES GAS FOR COOKING


HOME GAS MAKER
ROPE AND PULLEY
WHEN AIR IS DEPLETED, PULL UP DRUM AND OPEN AIR INLET VALVE
SMALLER OIL DRUM
FILLED WITH AIR
EYE BOLT–FITTED WITH LOCK NUT AND WASHER ABOVE AND BELOW
AIR INLET VALVE COCK
DOUBLE LOCK NUTS AND WASHERS
FUNNEL–SOLDER TO VALVE. GASOLINE IS POURED IN HERE TO HALF FILL CAN
SCREW TOP–SHELLAC AND SCREW TIGHTLY
NIPPLE–FLEXIBLE TUBE OR PIPING EXTENDED FROM HERE TO BURNER APPARATUS
GAS VAPOR FORMS HERE
GASOLINE
1 GALLON CAN
AS AIR IS USED AND VOLUME LESSENS, DRUM SINKS INTO LOWER DRUM, HOLDING AIR PRESSURE
CUT OUT BOTTOM OF SMALL DRUM
CARBURETOR
PIPE WITH SMALL HOLES DRILLED INTO TOP
DOUBLE LOCK NUT & WASHERS
SIDE OF CAN
HOLE CUT IN CAN FOR PIPE
STAND BRACKETS
LOWER DRUM IS FILLED WITH WATER
LARGE OIL DRUM–CUT OUT TOP
AIR PIPE–RUNS UP THRU CENTER OF LOWER DRUM TO SLIGHTLY ABOVE LOWER DRUM TOP
PAINT OR ENAMEL WHEN FINISHED
FLEXIBLE TUBE
VALVE–CHECKS FLOW OF AIR TO CARBURETOR
DOUBLE LOCK NUT AND WASHER FOR LEAKPROOF FITTING

Anyone the least bit handy with tools can make this practical gas generator. The device manufactures gas vapor for all cooking purposes at a fraction of the usual cost. Ordinary gasoline is converted into a safe dry fuel which can be used with any gas range or refrigerator. The cost of building is less than $5.00.

by A. H. Waychoff

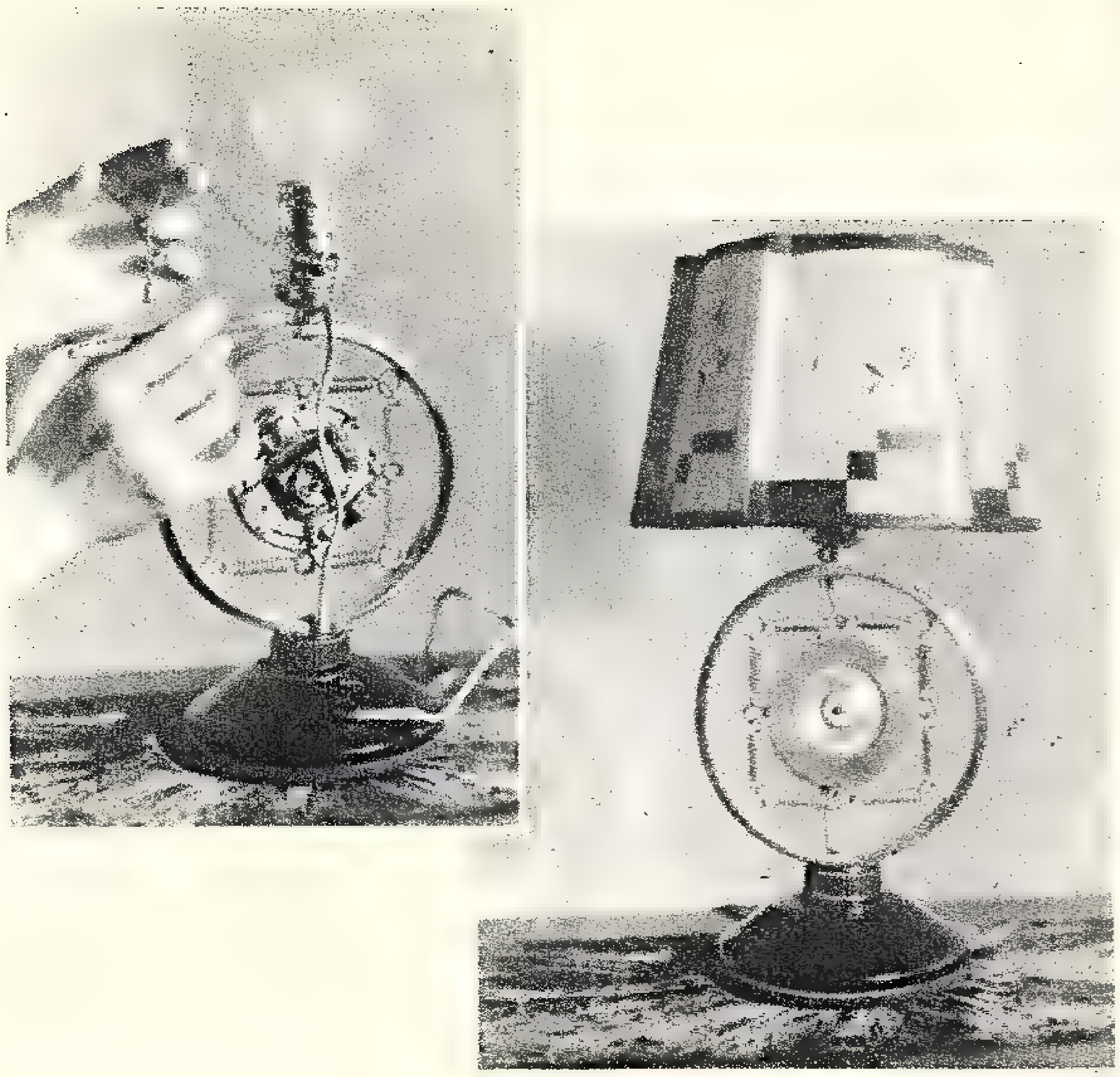
NO LONGER need any home be without the conveniences offered by city gas. A practical gas generator can be built with ordinary tools at a cost well under five dollars and when completed will produce a safe vapor gas at a cost far below that of either artificial or natural cooking gases.

The generating apparatus consists of a pressure tank and vaporizing unit. While an ordinary air compressor could be used to operate the vaporizer, the pressure tank is by far the most economical, since two oil drums are the only materials, except for a few pieces of pipe, needed to build it. The vaporizer consists of a one-gallon can containing a "carburetor" which mixes the air from the compression tank with liquid fuel, in this case good gasoline, to produce a safe vapor gas. The carburetor is a simple affair, consisting of a length of pipe drilled along the top with small holes, plugged at one end and bent into a circle just large enough to fit in the bottom of the one-gallon can. The carburetor connects to the pipe projecting up through the large oil drum by means of a flexible hose.

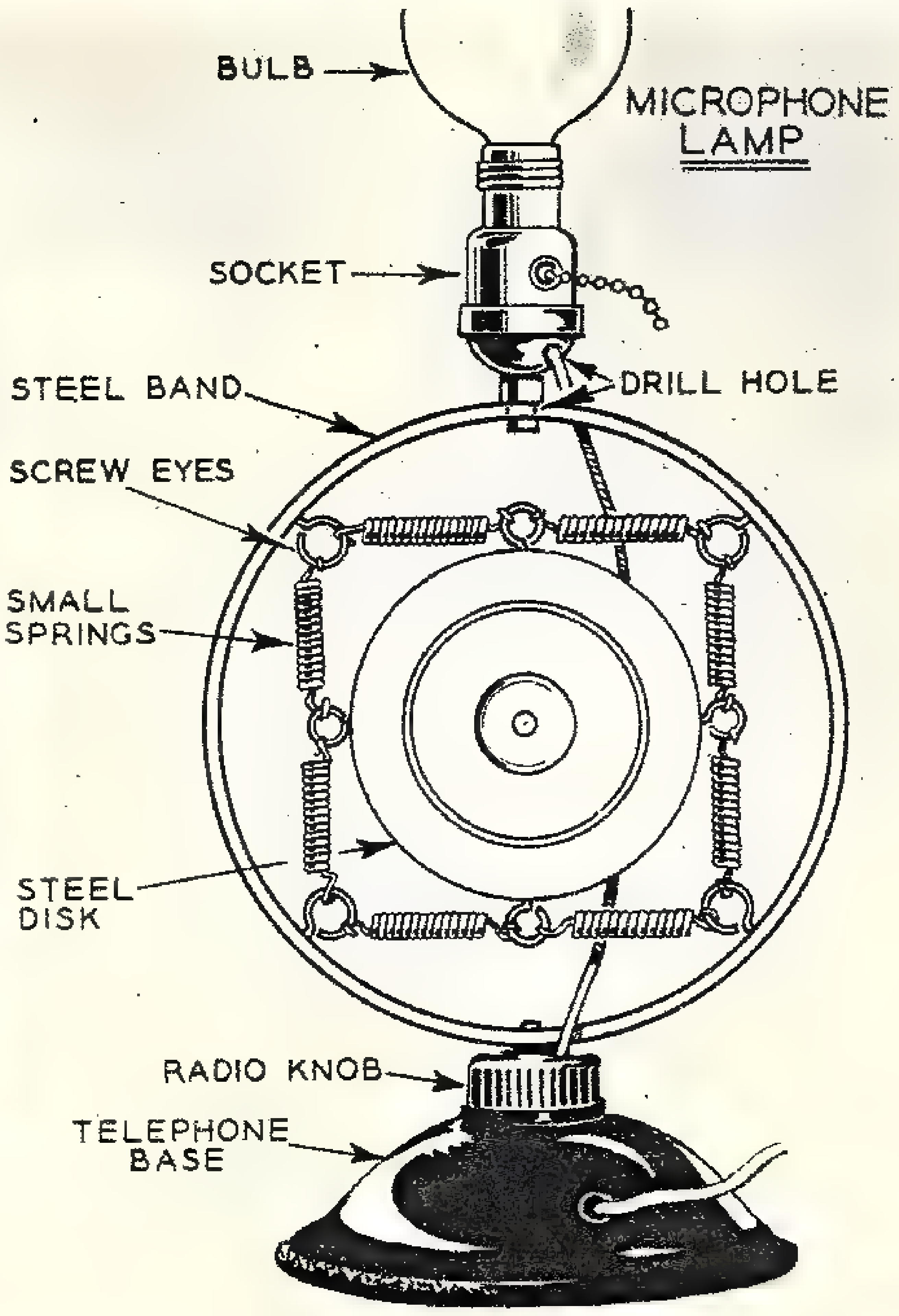
Assemble the compression tanks in the

[*Continued on page* 122]

"MIKE" LAMP SERVES AS RADIO DECORATION



Fashioned from odds and ends this attractive microphone lamp provides novel illumination for radio receiver. Phone base, radio knob, springs and piston ring comprise its form.



LOOKING very much like the familiar radio broadcasting microphone this odd radio lamp will attract the attention of everyone who sees it. Odds and ends are used in the making of the lamp, which uses an old telephone base for the stand, a large size piston ring or metal band for the microphone ring and a turned metal or wooden disc for the dummy microphone.

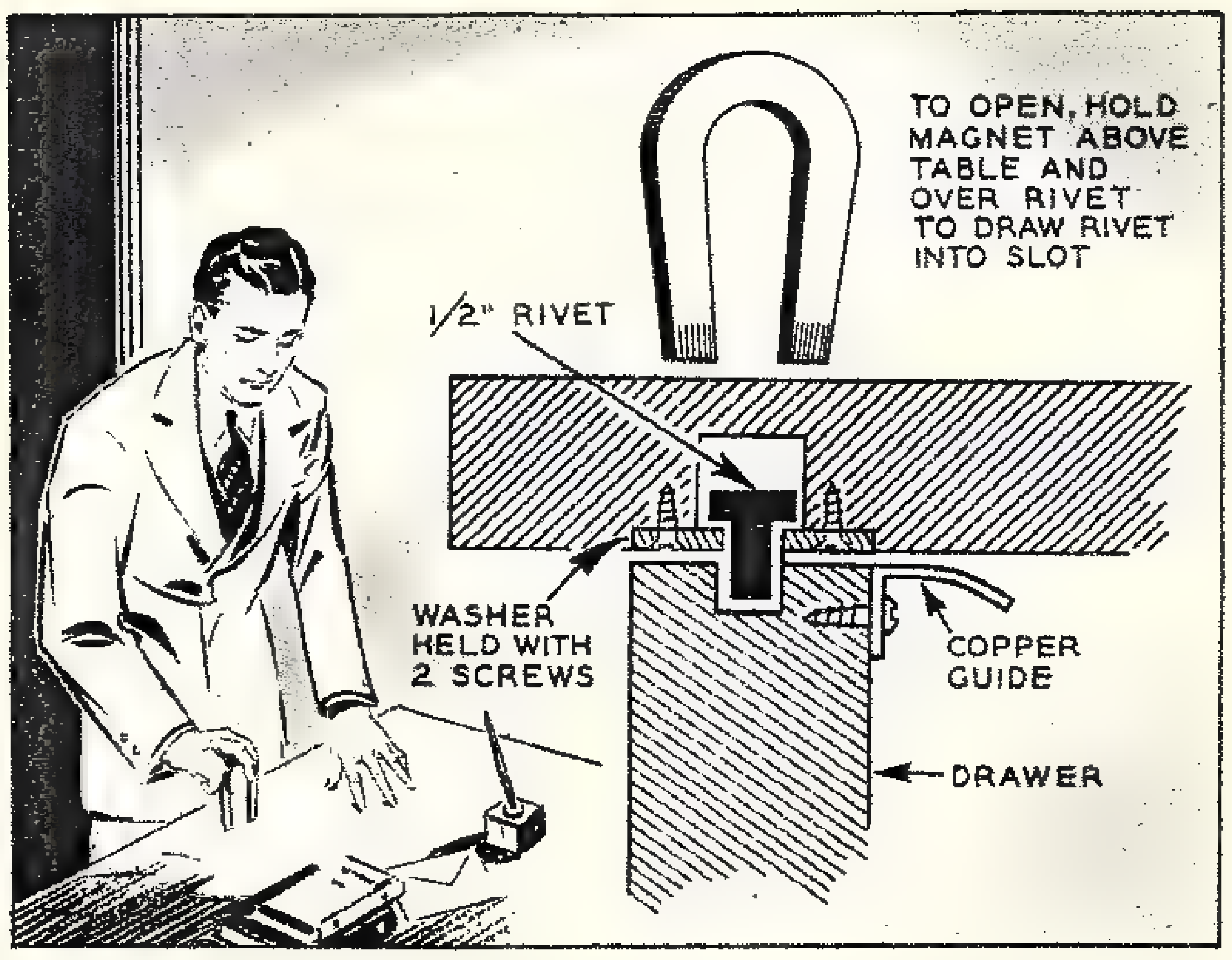
Two holes large enough to pass a medium sized machine screw are drilled in the ring opposite each other. A bolt passed through one holds a chain socket in place while the lower hole serves to take a longer bolt which holds the ring, radio knob and base assembly. Small holes into which screw eyes can be forced are drilled at proper intervals for the attachment of the springs.

The microphone dummy is a wood or metal disc about 3¼ inches in diameter. After the turning is completed it can be painted with aluminum bronze and trimmed with black enamel. Four screw eyes are attached to the side of the microphone and the disc suspended in the ring with small wire springs. Should the builder possess an old telephone transmitter or radio earphone unit this can be substituted instead and connected through the radio receiver for stunt broadcasting.

An inexpensive parchment shade clipped over the bulb completes this original radio lamp.

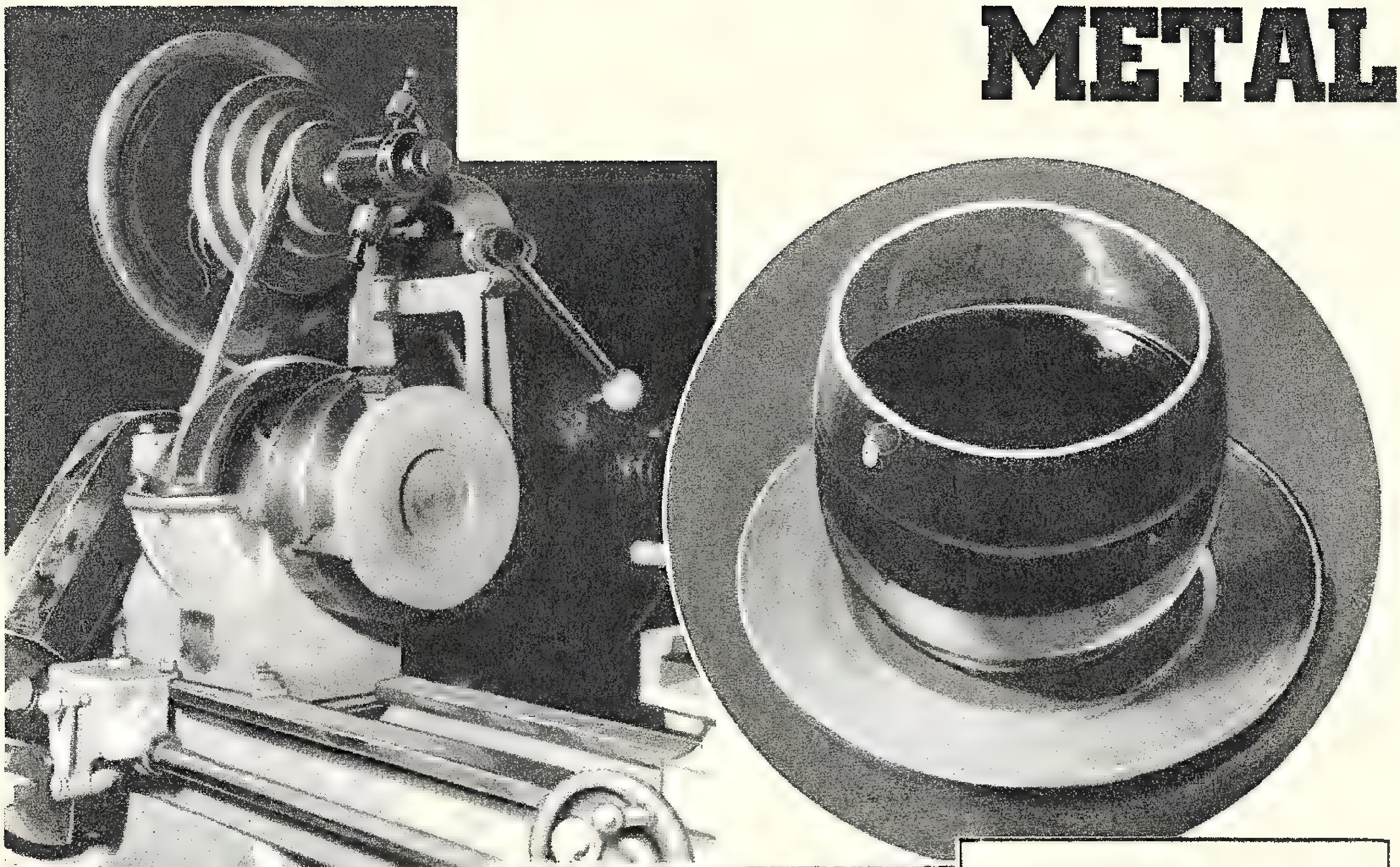
Magnet Opens Secret Lock

WHERE a practical lock is desired without the objectionable exposed keyhole a magnetic type may be used without anyone discovering the secret of its operation. A hole into which a ½-inch rivet can fit loosely is drilled in the underside of the desk top and a metal plate mounted flush over it so that just the rivet stem may pass through. A hole the size of rivet is then drilled in desk drawer, the copper guide installed and the lock is ready for use. A large magnet serves as key.

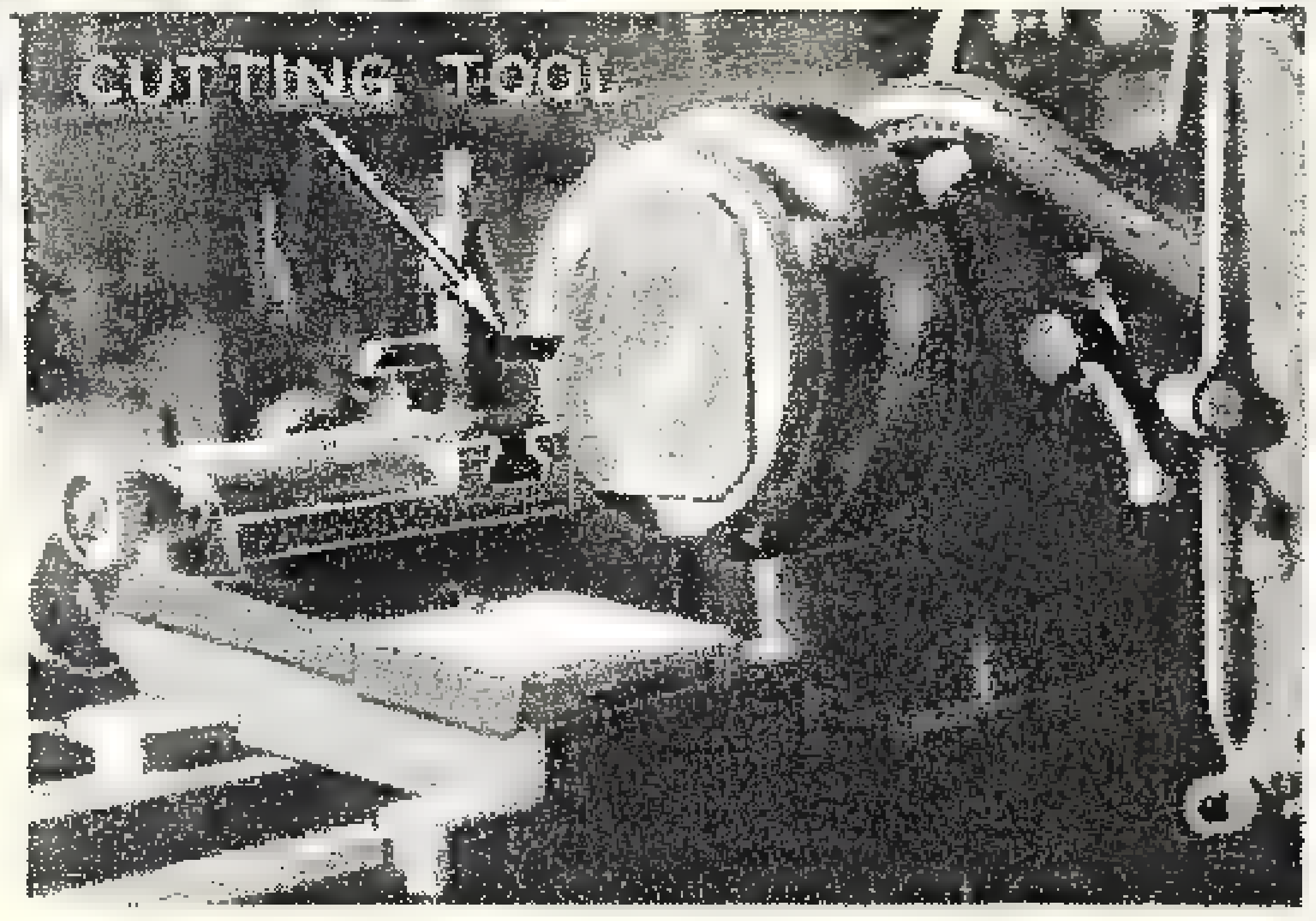

TO OPEN, HOLD MAGNET ABOVE TABLE AND OVER RIVET TO DRAW RIVET INTO SLOT
½" RIVET
WASHER HELD WITH 2 SCREWS
COPPER GUIDE
DRAWER

When held directly over the rivet the magnet lifts it, freeing the drawer. A spring copper guide attached directly in back of drawer catch permits its closing without jamming the rivet.

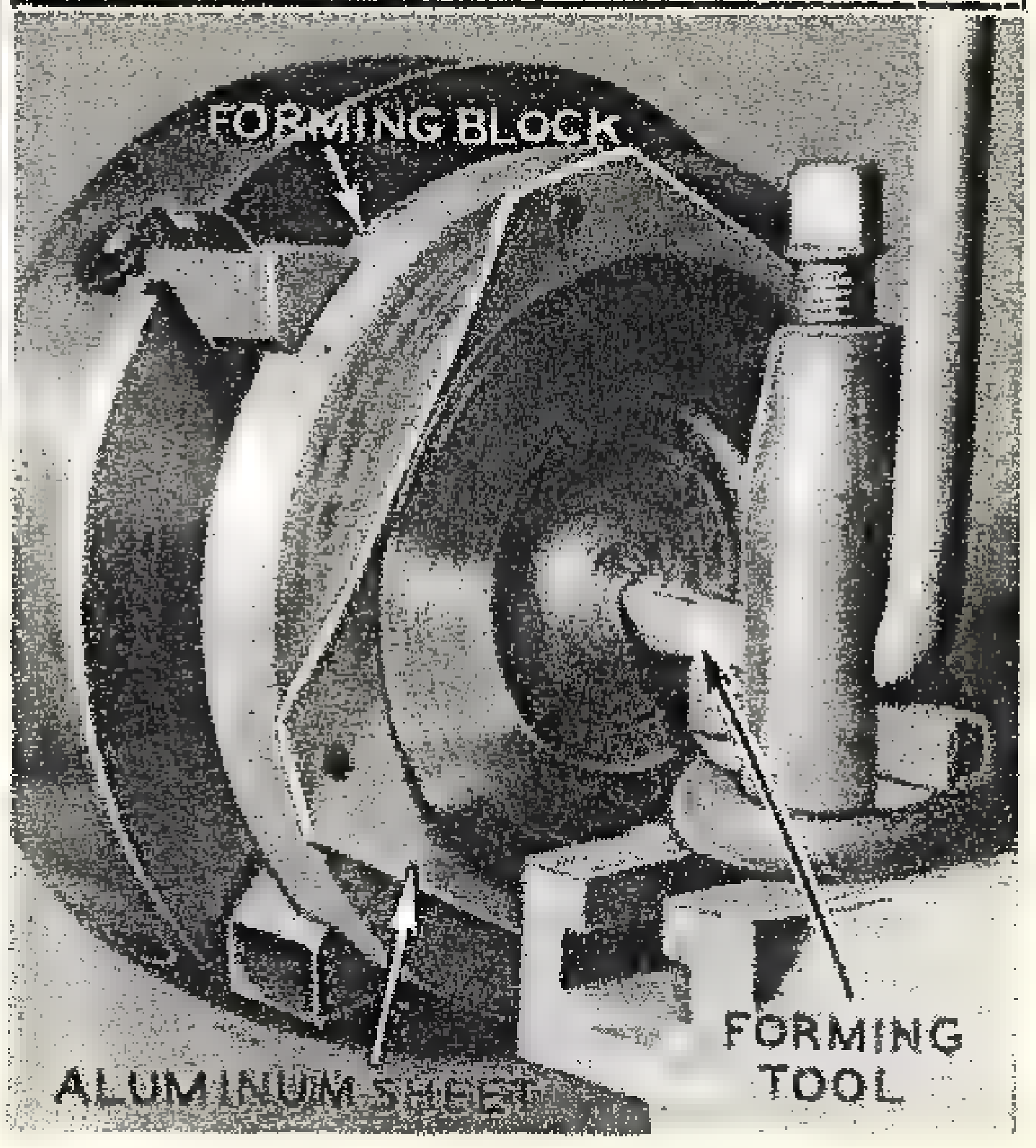
METAL



The simple coaster pictured in the circle above is the ideal project for the beginner in metal spinning. Before any actual spinning is done a hardwood form or mold must first be made. Above is shown a completed mould in the lathe.



After the metal sheet has been turned to fit the wooden form the square corners are trimmed off with a regular lathe cutting tool.



Right—In spinning this aluminum dish run the forming tool from the center of the work until the sheet metal follows the shape of the hardwood form.

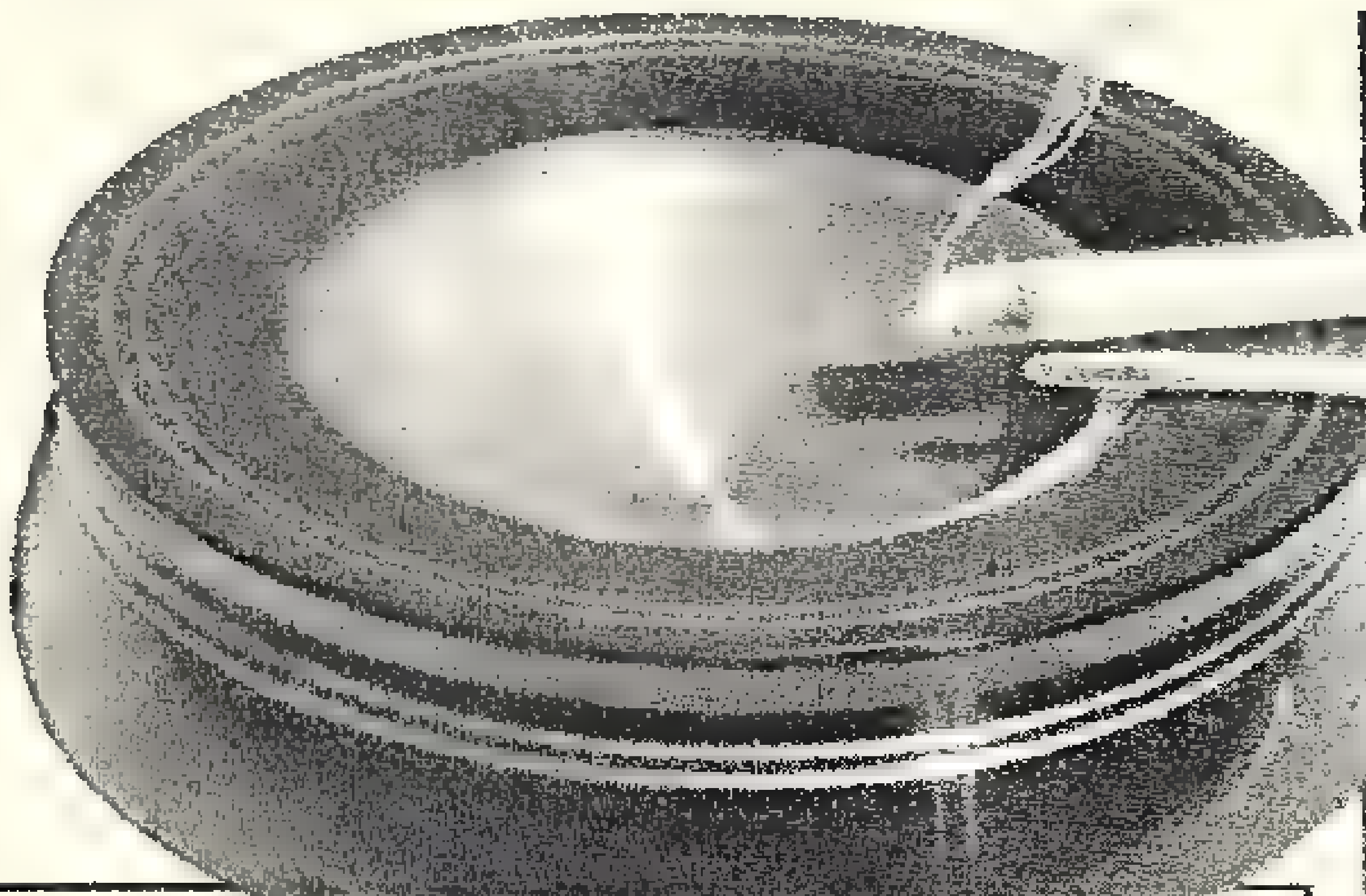
by Dale R. Van Horn

SOME soft metal lends itself so admirably to manipulation in a wood turning lathe, that projects involving its use are an interesting home shop diversion. With some patience one can turn out very presentable creamers, trays and boxes with lids from sheet brass, aluminum and copper.

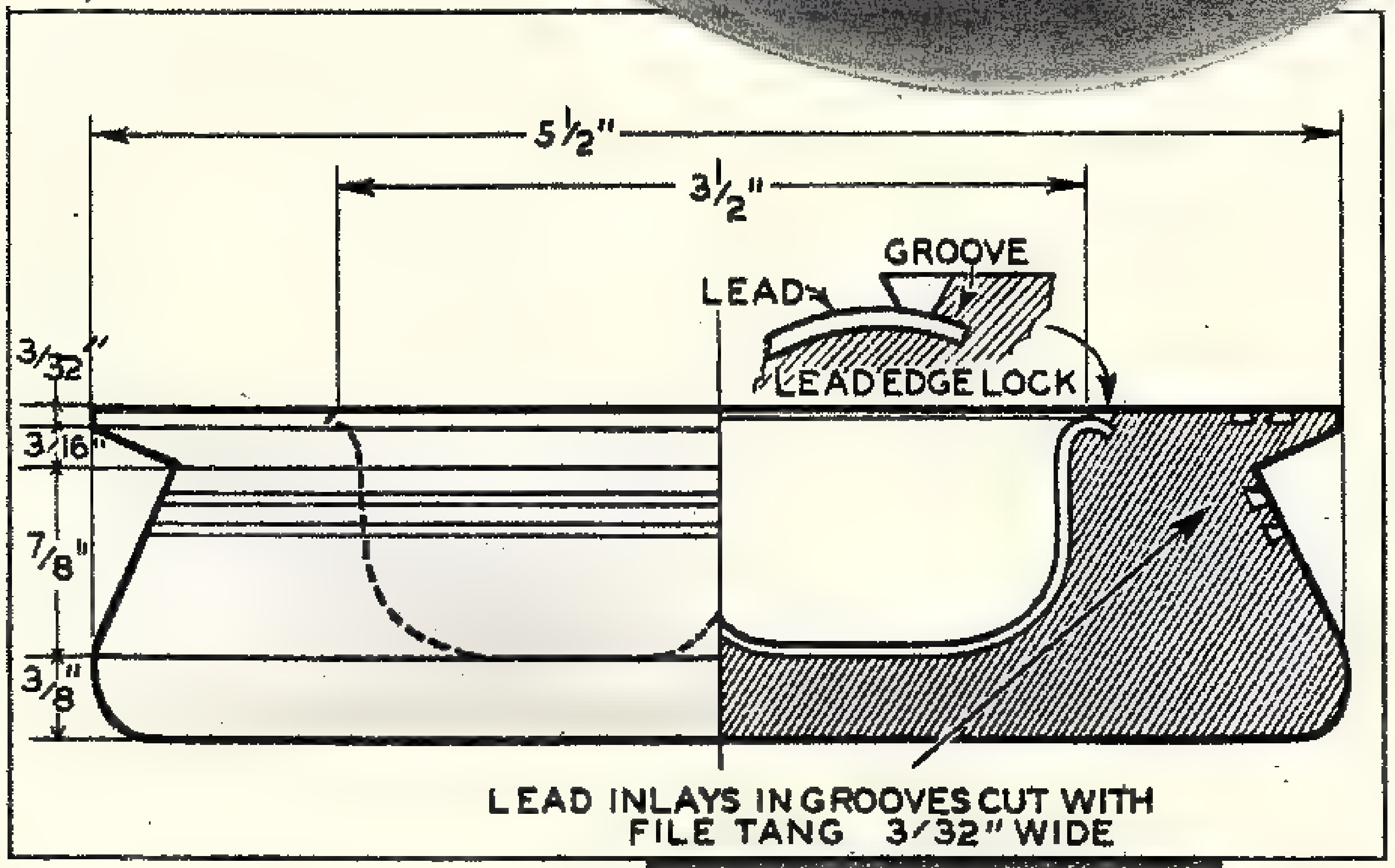
Sheet lead is so ductile, easily worked and bears such a close resemblance to pewter when finished, that this metal is ideal for the beginner in spinning metals. This article covers briefly a number of simple projects, each one easily made. It also touches the use of a metal lathe for harder metals.

One of the easiest ways to spin soft metal dishes is as follows: Briefly, you need two pieces of wood and a sheet of metal. Turn one hardwood block to the shape you desire for the inside of the dish: Turn another small block from 1½ to 2 inches in diameter and about ½ inch thick with one side smooth, the other carrying the deep indentation of the dead center. The sheet of lead is centered between these two blocks, rubbed with candle and the metal gradually forced over the form. Should there be any tendency for the metal to work out of line, make a depression in the right end of the mold not more than the sheet metal thickness in depth and see that the tail stock wood block is a little smaller. Then turn the tail stock up tight. This forms a bulge in the metal sheet which locks it in position so long as the tail stock is turned up snug. After forming, the metal is polished, the waste trimmed off and the piece then dipped in lacquer. Sheet pewter, aluminum, copper and brass can be turned into small, attractive dishes in the same manner.

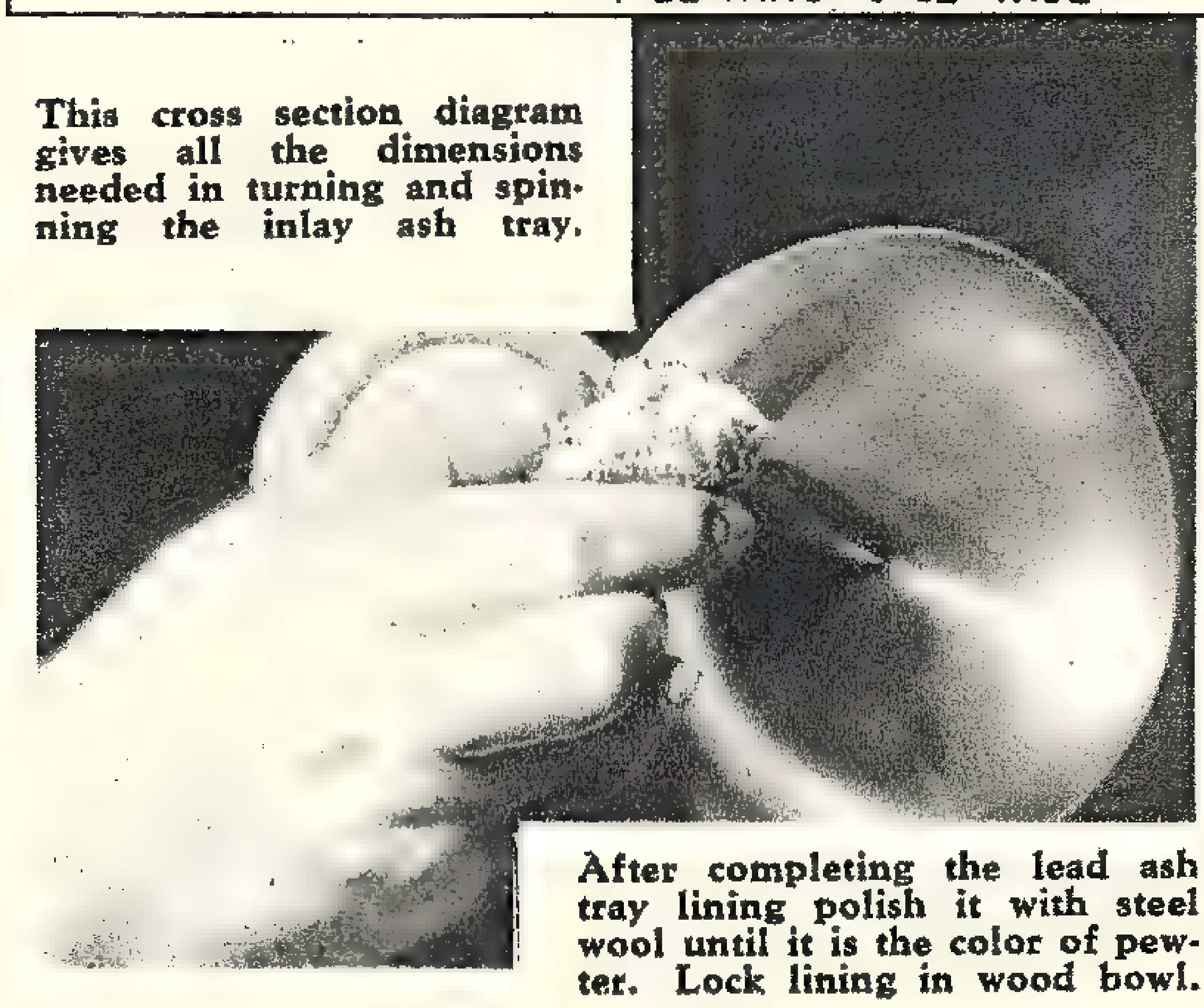
PROJECTS ON A LATHE



This beautiful inlay turning can be duplicated in your shop after doing some experimenting with the more simple projects. The bowl is turned from walnut and the inlays filled with strips of lead. The bowl lining is spun from $\frac{1}{16}$" sheet lead.



This cross section diagram gives all the dimensions needed in turning and spinning the inlay ash tray.



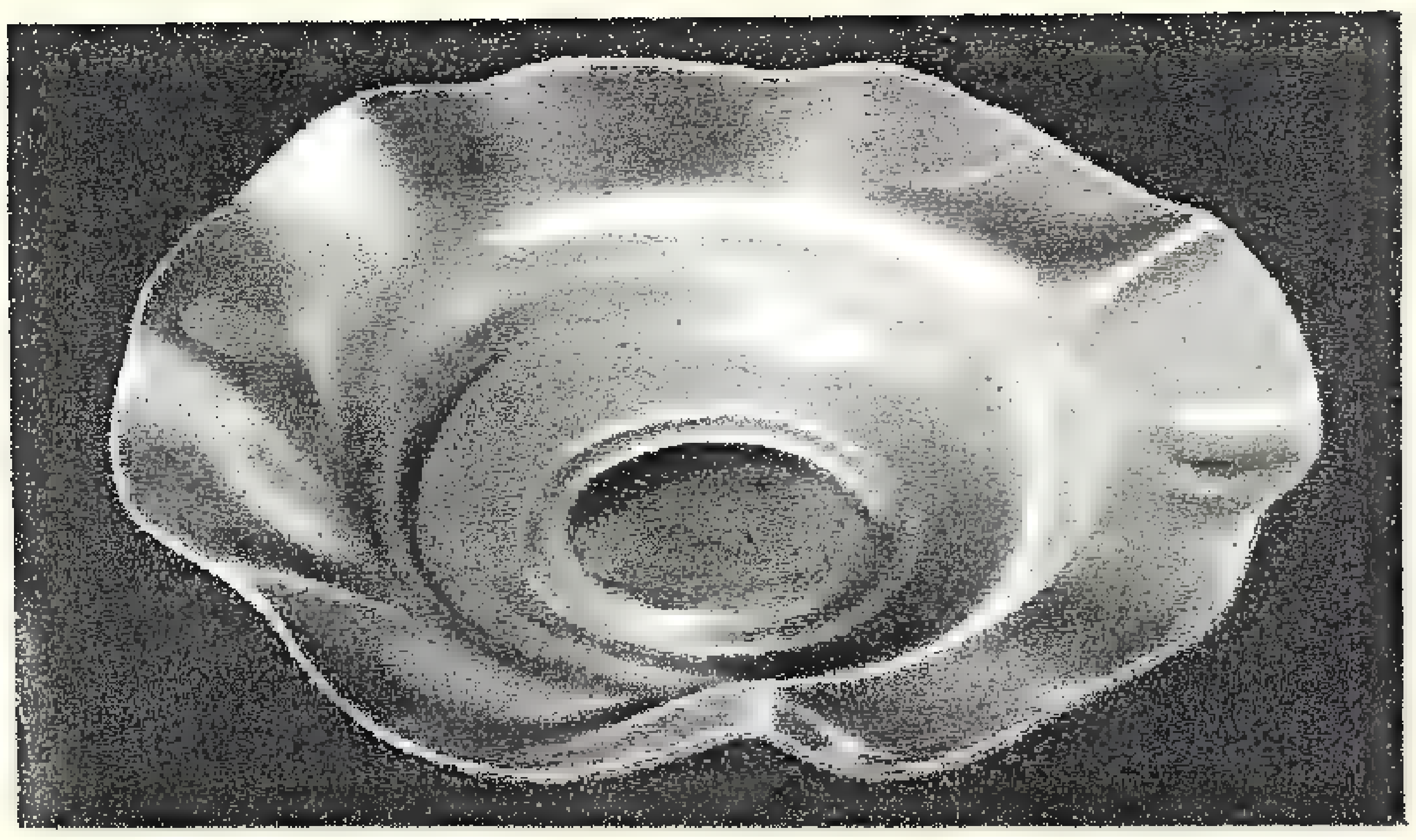
After completing the lead ash tray lining polish it with steel wool until it is the color of pewter. Lock lining in wood bowl.

Access to a metal turning lathe simplifies greatly, the work involved in forming shallow dishes from soft and semi-hard sheet metal. A little coaster of sheet aluminum of considerable thickness was formed in a jiffy in the metal lathe setup. The hardwood block turned to shape, acts as a mold for the coaster. Any round tool can be set in the tool post, then the metal forced to the shape of the mold and later the waste cut off. After forming the piece should be rubbed with coarse steel wool. Rough aluminum or copper pin trays can be made without special rigging in the wood lathe by using a wood mold and letting the edges take whatever shape they wish.

Let's next try a simple, all-metal ash tray which can be made in groups of four for home use or bridge parties. From a wholesale plumbing or hardware concern, get sheet lead having a $\frac{1}{16}$-inch thickness. Turn a soft wood block down in the lathe to 4 inches in diameter. Bend the lead corners over the side of this and tack in place. Start up the lathe and with the round end of a dowel, rub the lead flat against the wood. To reduce friction and heat and to prevent possible cutting of the lead by the dowel, rub the metal surface with a candle stub for lubrication. At high speed, rub this now smooth surface with fine steel wool to give it a good luster. Then wipe with a rag dipped in soda water or vinegar to cut off the grease.

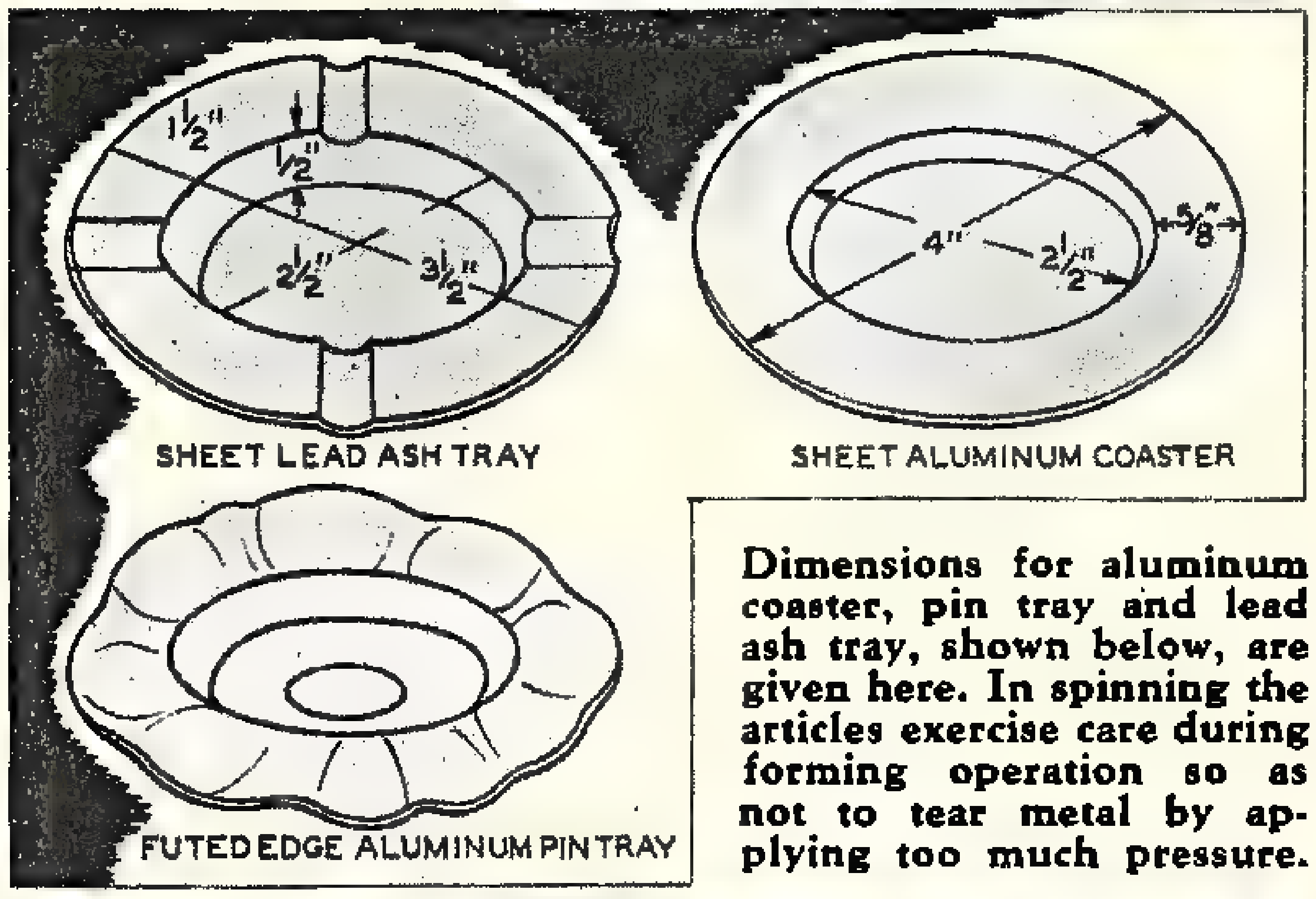
Cut another block of soft wood 3½ inches square and rather thick, then with the drill press, bore a ½-inch hole from each of the four sides to the center of the block. Center this block in the lathe and turn away enough of the right side to expose half of the holes, turn the block round and sand smooth. The lead square is laid over this with the polished side next to the wood and the corners again tacked fast.

Using the dowel again, and the candle stub, the unfinished side of the lead is smoothed and worked into the shape of the wood mold. When the depression has been made, remove the whole unit from the lathe and, laying a

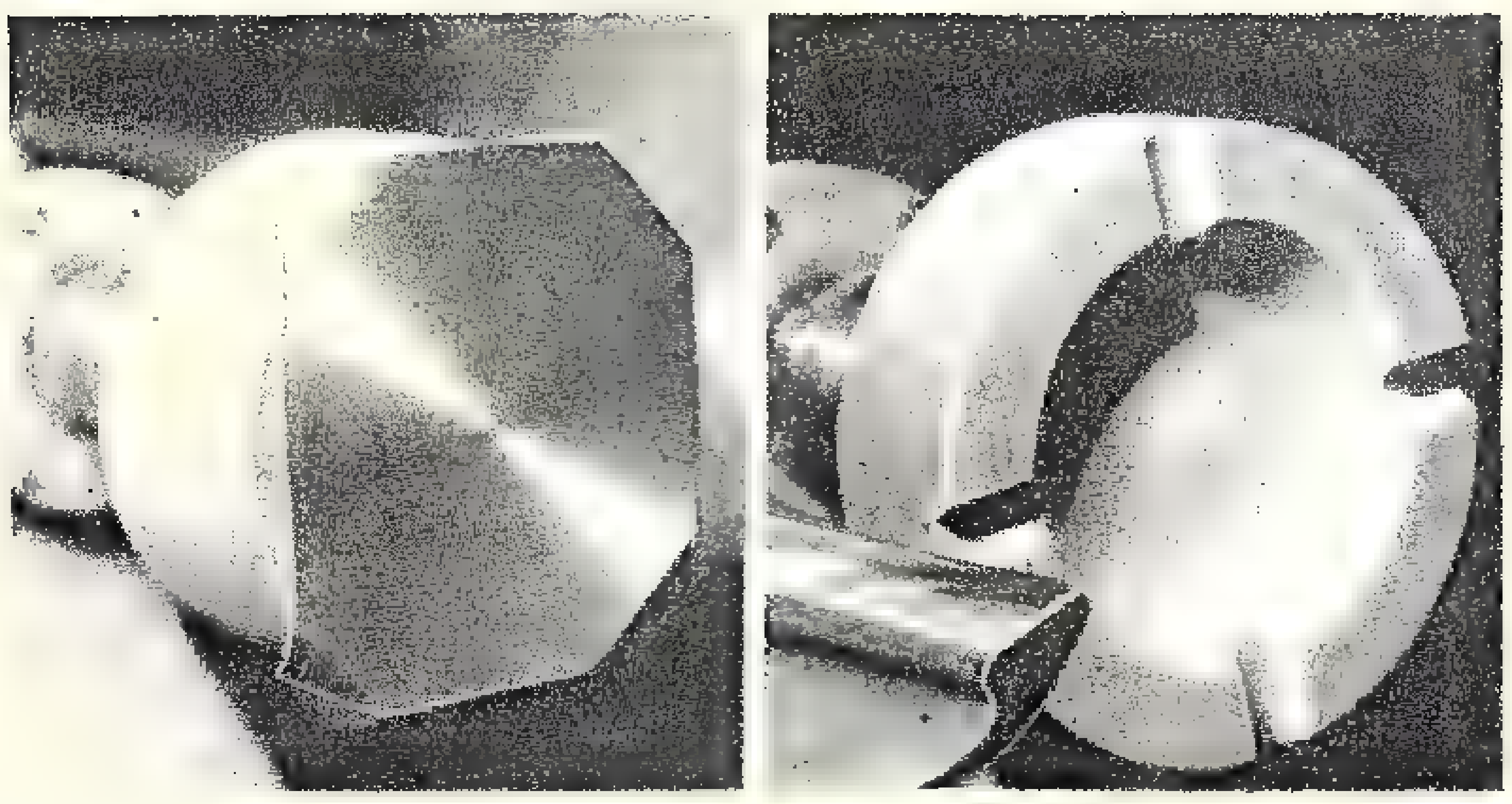


This attractive dish makes a novel pin tray when completed. After successfully completing the aluminum coaster you are ready to advance to this project which is spun from aluminum.

Turned in the same manner as the inlay ash tray this bulb dish makes an attractive decoration for the living room.



Dimensions for aluminum coaster, pin tray and lead ash tray, shown below, are given here. In spinning the articles exercise care during forming operation so as not to tear metal by applying too much pressure.



To spin this lead ash tray first drill ½" holes in a block of thick stock 4" square. Holes are drilled completely through in crosswise fashion. When block is cut cigar grooves result.

Left—The completed lead ash tray as it appears after completion of the turning operation. The form used in spinning was turned from the wood block shown above.

⅜-inch dowel or iron rod squarely over the four grooves, strike sharply with a hammer. The lead is forced down to the shape of the finished tray. Putting back in the lathe will be necessary for polishing with fine steel wool. Finally, the waste is cut off by holding the point of a jack knife on edge, resting on the tool rest, and the lathe turned by hand. This insures a smooth cut-off. Before dipping in lacquer, wipe again with the soda-soaked rag. The finished ash tray is shown in the accompanying illustrations. If a set of four trays are to be made, you can use only one block of wood for the form, smoothing the lower sides of the four sheets, then turning the mold and finishing the four.

A more elaborate ash tray, one which will not need apologies on any office desk, is made in the form of a lovely walnut box with lid, the upper area of which is overlaid with sheet lead to prevent burning. A small hole in the top permits cigarette butts to be dropped inside where they go out almost instantly.

This is turned from two walnut blocks 5½ inches square and about 2 inches thick. One block becomes the lower half, the other the top of the tray. Turn the bottom to the dimensions shown. It will appear as figure 6 shows when completed. Bore a small hole clear through the center of the other block to insure centering, since this is turned first as shown in figure 7, then reversed in the lathe and the top turned to shape so that it will then look as figure 8 shows. Note that a groove is turned for the edge of the lead to lock into and that the surface is lowered about the lead thickness to give a smooth outline later. A lead sheet is cut and centered at the tail stock, rubbed with candle and with a dowel, gradually worked over the top until it fits tightly. With a sharpened dowel, the lead is forced into the groove, the surplus cut away, then sanded and finished.

Note that the lead must be carried over the edge and locked at a point where the diameter is a little less than the maximum diameter over which the lead is laid. This locks the overlay in place and prevents it from working loose or coming off.

Use steel wool, only, on the metal and wipe it with the saturated soda rag. The best way to lacquer the metal is to flow on the liquid, letting the surplus run off. This should be done right side up. When dry, put back in the lathe and buff with steel wool, then polish with a clean cloth. Finally bore a ½-inch hole through the top completing the ash tray.

[*Continued on page* 124]

MICRO-TEST YOUR CAR'S CYLINDER OIL

WHEN the average driver looks at his speedometer and notes that it's time for his regular oil change, he usually wonders whether, after all, his oil really does need changing. Unfortunately, he has no final check other than the word of the service station attendant.

The result is that his oil is often changed long before it is necessary or it is left in the crankcase far too long.

There is a simple, sure method of *seeing* just what the condition of your oil is. All the equipment necessary for this experiment is a few strips of blotting paper and an inexpensive microscope. A microscope which has a magnification of twenty-five diameters is sufficient.

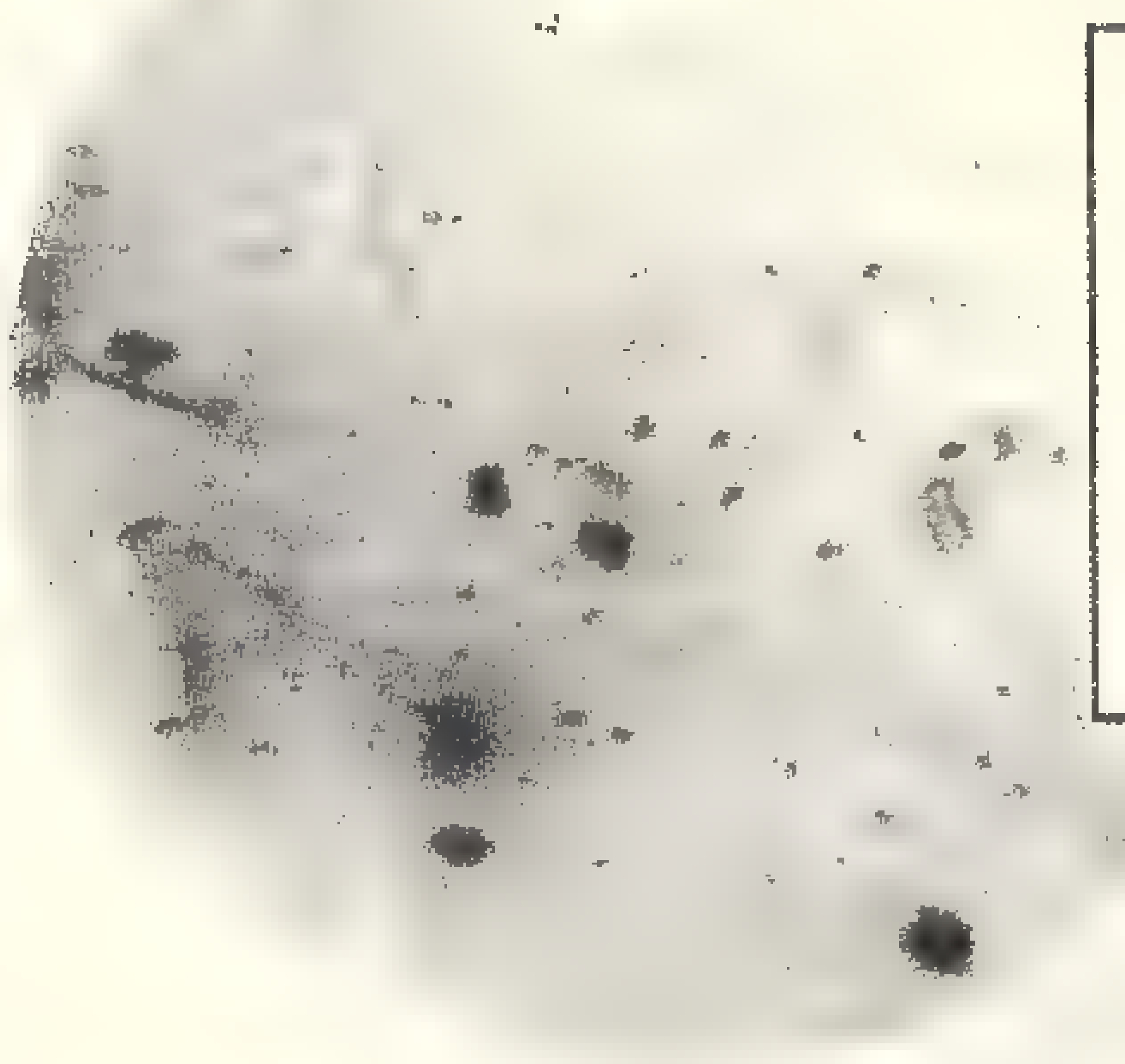
The idea is to convert the microscope into a semi-dark field instrument. This is done by substituting a strip of white blotting paper, about 1x3 inches, for the conventional glass slide.

The movable mirror is not used for directing the light, the lighting comes from above the object being examined. An ordinary gooseneck lamp will serve very well as a source of illumination.

Remove a drop of oil from the crankcase. Place it on a strip of blotting paper and note how rapidly it spreads. This is a good test of the amount of gasoline dilution. Now place the strip in the microscope, and adjust the light so it strikes the paper and reflects into the microscope.

As the oil sinks into the blotting paper it leaves the carbon and metal fragments on the surface. The strong side lighting brings these into sharp relief. The metal particles gleam, while the carbon shows a dull black. A good check on the amount of carbon in the head and on the valves may be made in this manner.

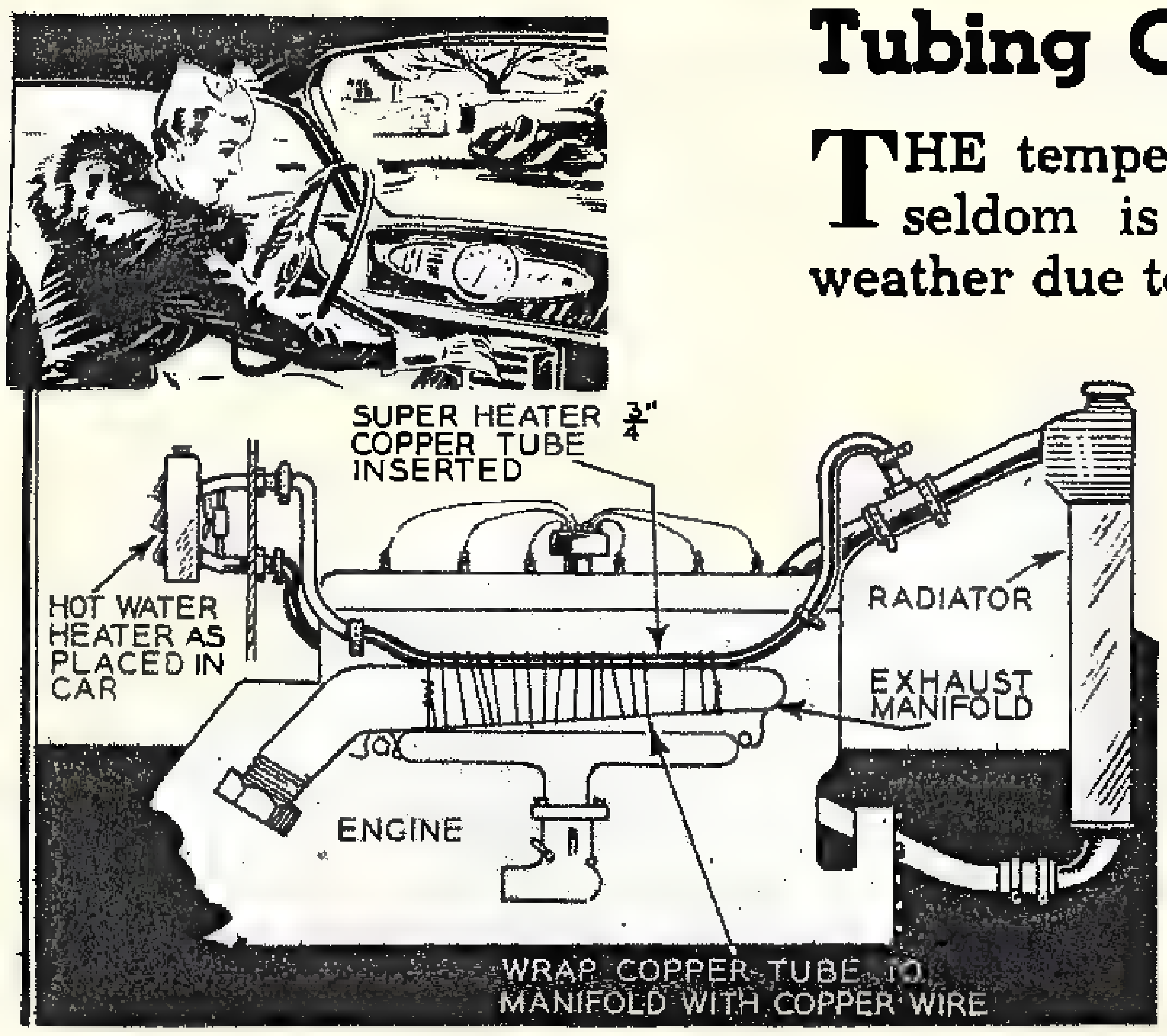
Checking the amount of foreign matter in automobile cylinders requires only an inexpensive microscope set up as shown here.



Right—Oil saturated blotter before oil had been placed in crankcase. Top picture shows particles of foreign matter in oil after used.

Samples of oil for making this interesting test can be removed from any car simply by pulling out the oil level gauge and applying a drop of oil to a piece of white blotting paper. Oil containing impurities will sparkle.

TIPS FOR MODERN MOTORISTS


SUPER HEATER ¾" COPPER TUBE INSERTED
HOT WATER HEATER AS PLACED IN CAR
RADIATOR
EXHAUST MANIFOLD
ENGINE
WRAP COPPER TUBE TO MANIFOLD WITH COPPER WIRE

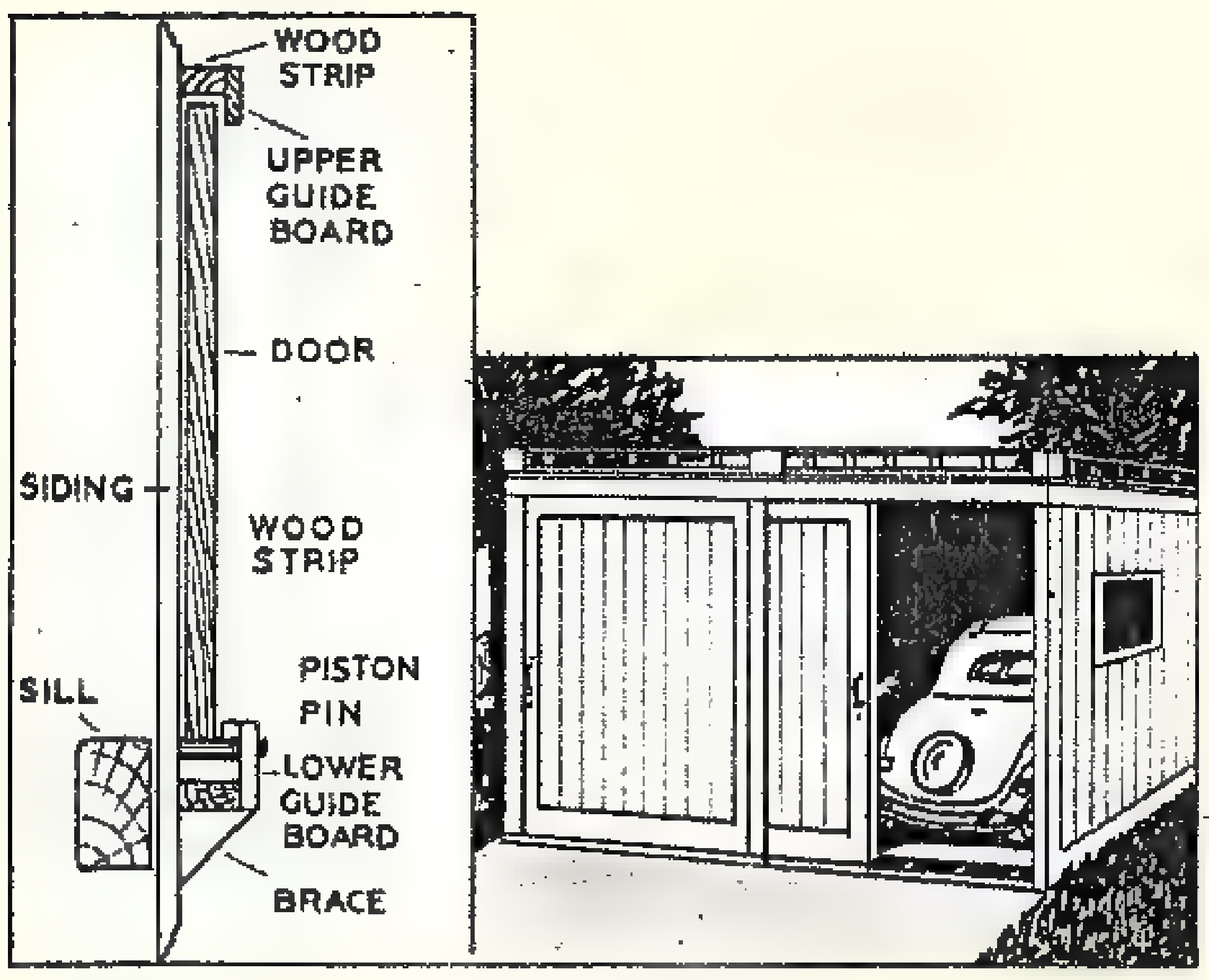
Tubing On Manifold Helps Car Heater

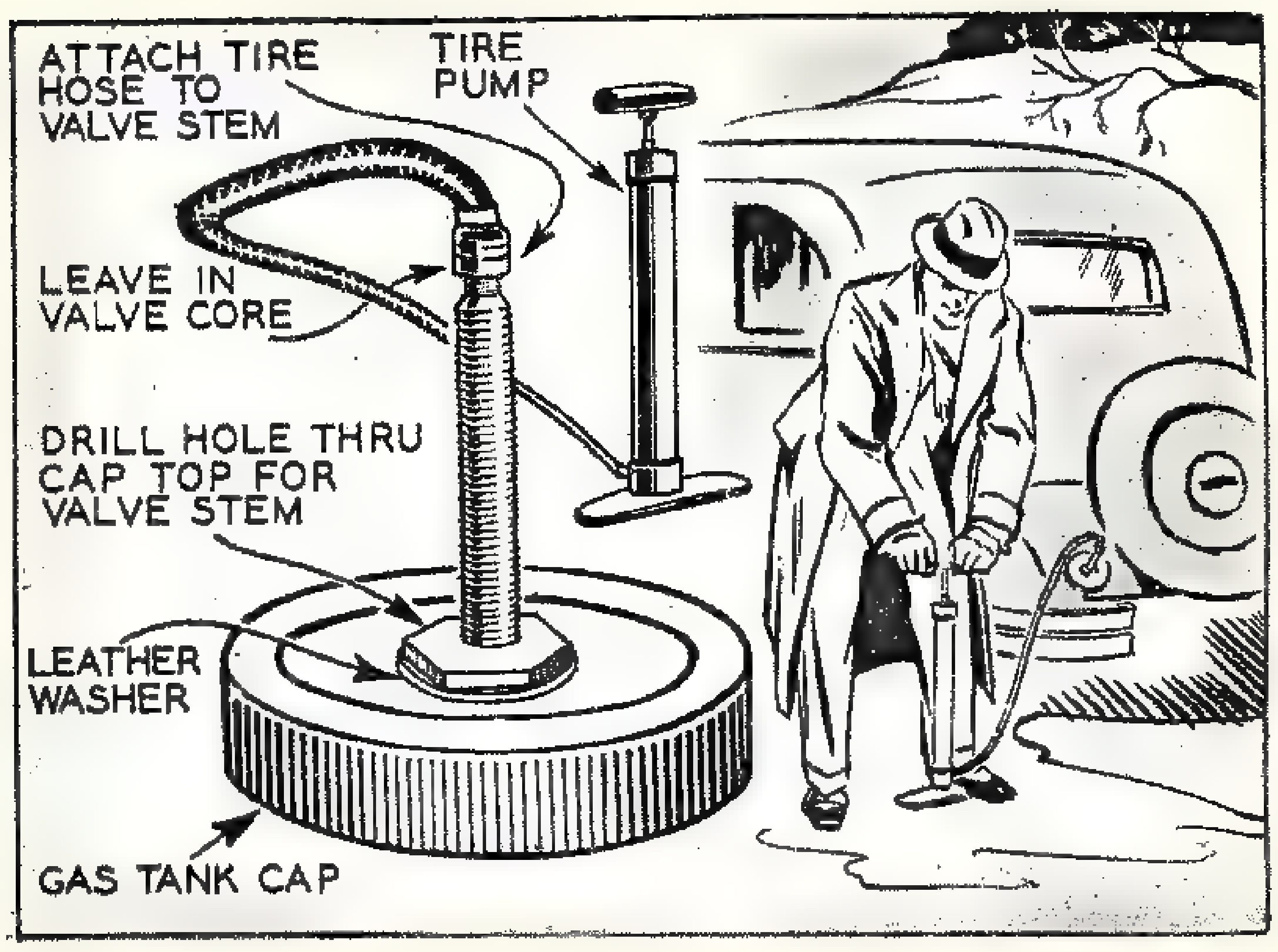
THE temperature of the average automobile heater very seldom is sufficiently high for driving in cold winter weather due to the amount of hot water tubing exposed to the cold blast of air produced by the momentum of the car and the fan.

The temperature of the average hot water heater can be raised considerably by replacing the original tube that connects to the radiator coupling hose with a length of copper tubing. Fasten the copper tubing to the manifold with copper wire wrapping a layer of asbestos paper over both if you desire the maximum amount of heat.—William Tatina, Chicago, Illinois.

Piston Pin Makes Garage Door Roller

PISTON pins which have been taken from a salvaged car make good rollers for use on garage doors. The doors are mounted between guide strips with the piston pins fastened in place with large lag screws. Where the garage is provided with a concrete floor the rollers may be installed in a track in the garage floor so as not to interfere with the car's entering and leaving. The rollers will provide easy garage door operation.—Curtis Wilson, San Antonio, Texas.


WOOD STRIP
UPPER GUIDE BOARD
DOOR
SIDING
WOOD STRIP
SILL
PISTON PIN
LOWER GUIDE BOARD
BRACE

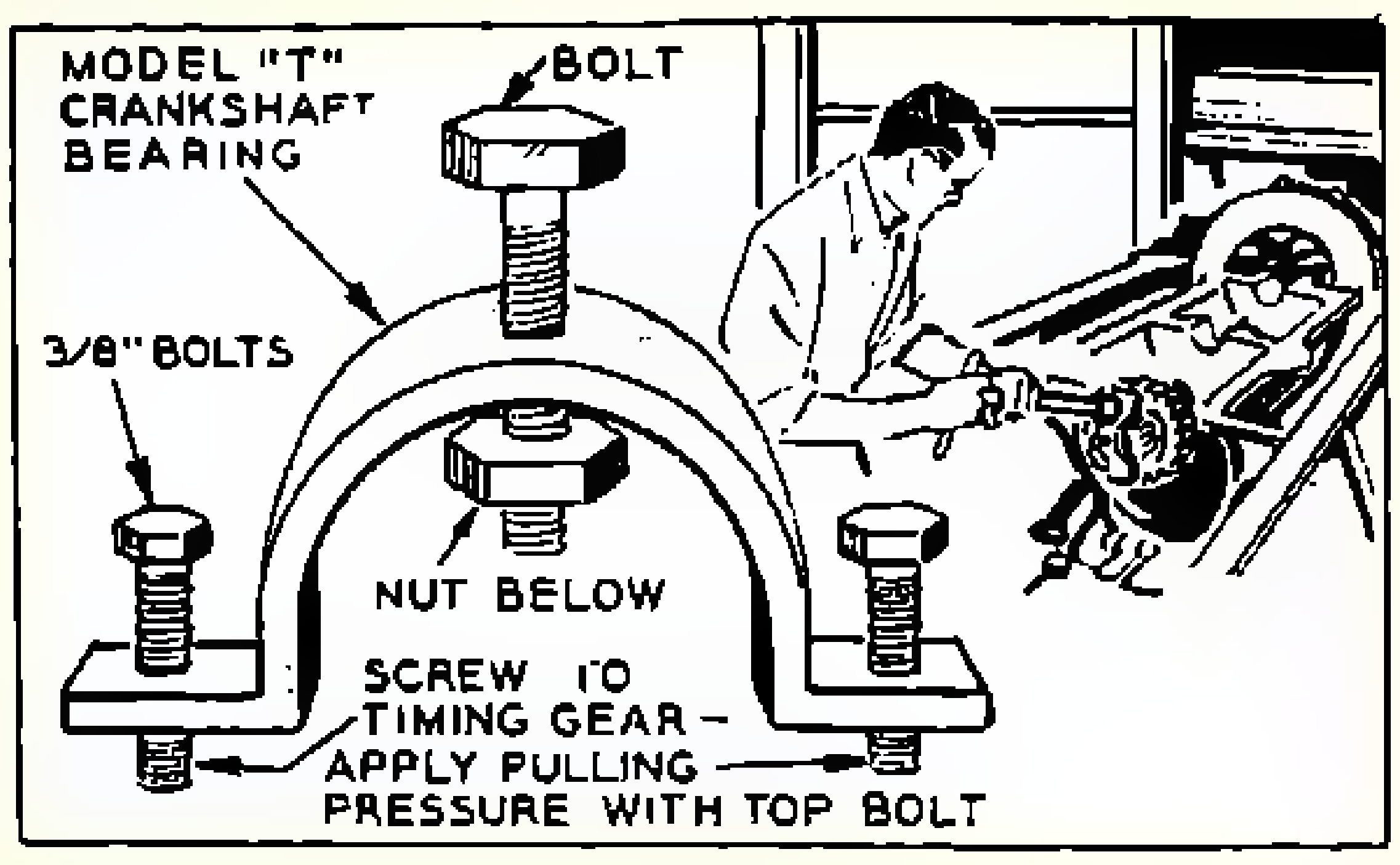

ATTACH TIRE HOSE TO VALVE STEM
TIRE PUMP
LEAVE IN VALVE CORE
DRILL HOLE THRU CAP TOP FOR VALVE STEM
LEATHER WASHER
GAS TANK CAP

Valve Aids Winter Starting

MUCH of the disagreeable trouble experienced in starting a car in cold weather can be eliminated with a replacement gas tank cap and an old inner tube valve and stem insert. Drill a hole large enough to pass the valve stem and then attach the cap to the gas tank. Connect a hand pump to the stem giving it about a dozen strokes with both choke and throttle controls pulled out to maximum. Now step on the starter, allow the motor to make a few revolutions, and push in the choke.—Q. G. Biegert, Junction City, Kan.

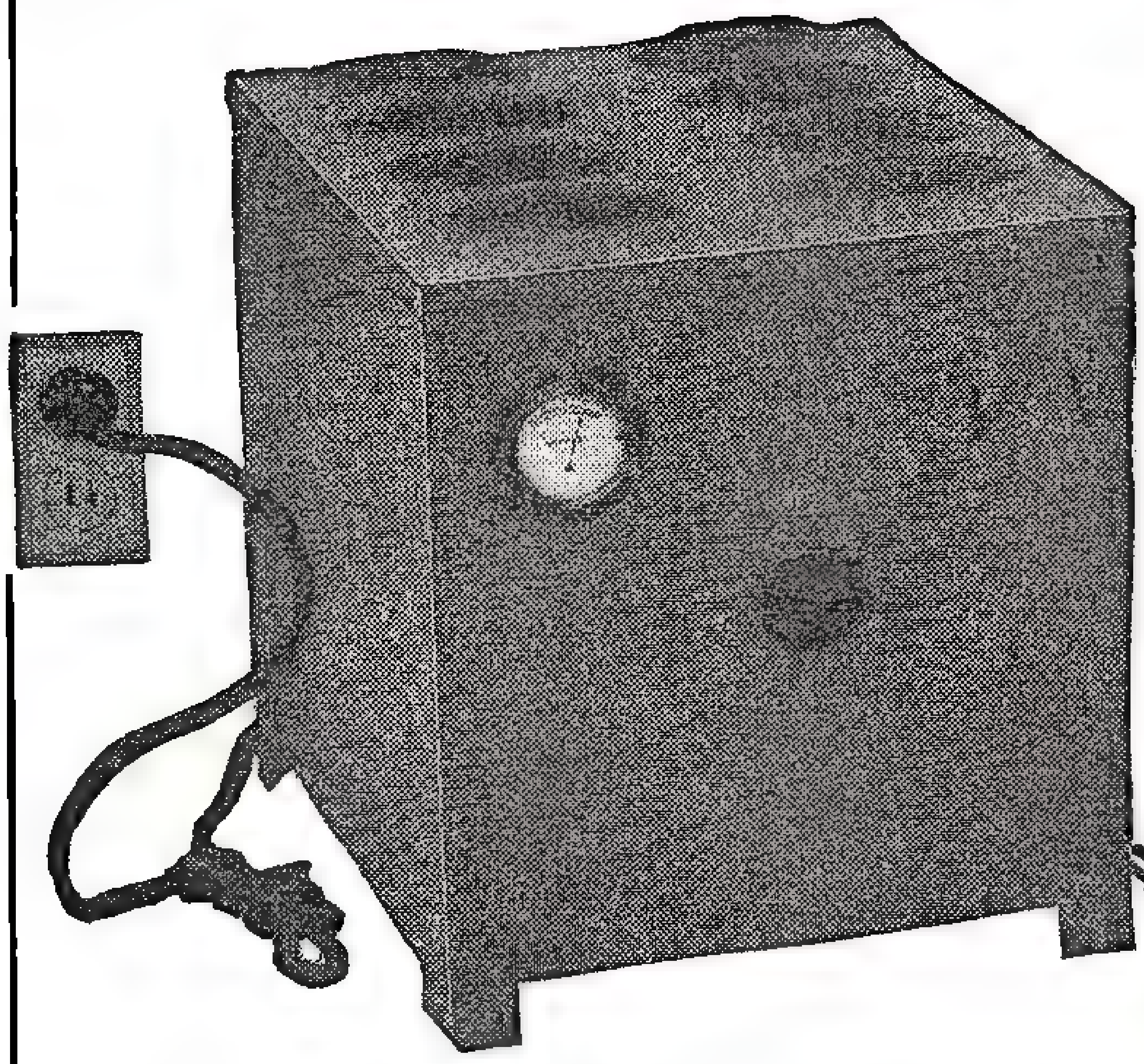
Wheel Puller Made Of Old Bearing

BY DRILLING a hole through the center of the cap of a model T connecting rod bearing and inserting a bolt and nut as illustrated a strong timing gear puller can be constructed. Lodge ⅜-inch bolts in the gears through the outer holes of the bearing and apply the necessary pressure.—A. G. Kociyan, San Leandro, Calif.


MODEL "T" CRANKSHAFT BEARING
BOLT
3/8" BOLTS
NUT BELOW
SCREW TO TIMING GEAR — APPLY PULLING PRESSURE WITH TOP BOLT

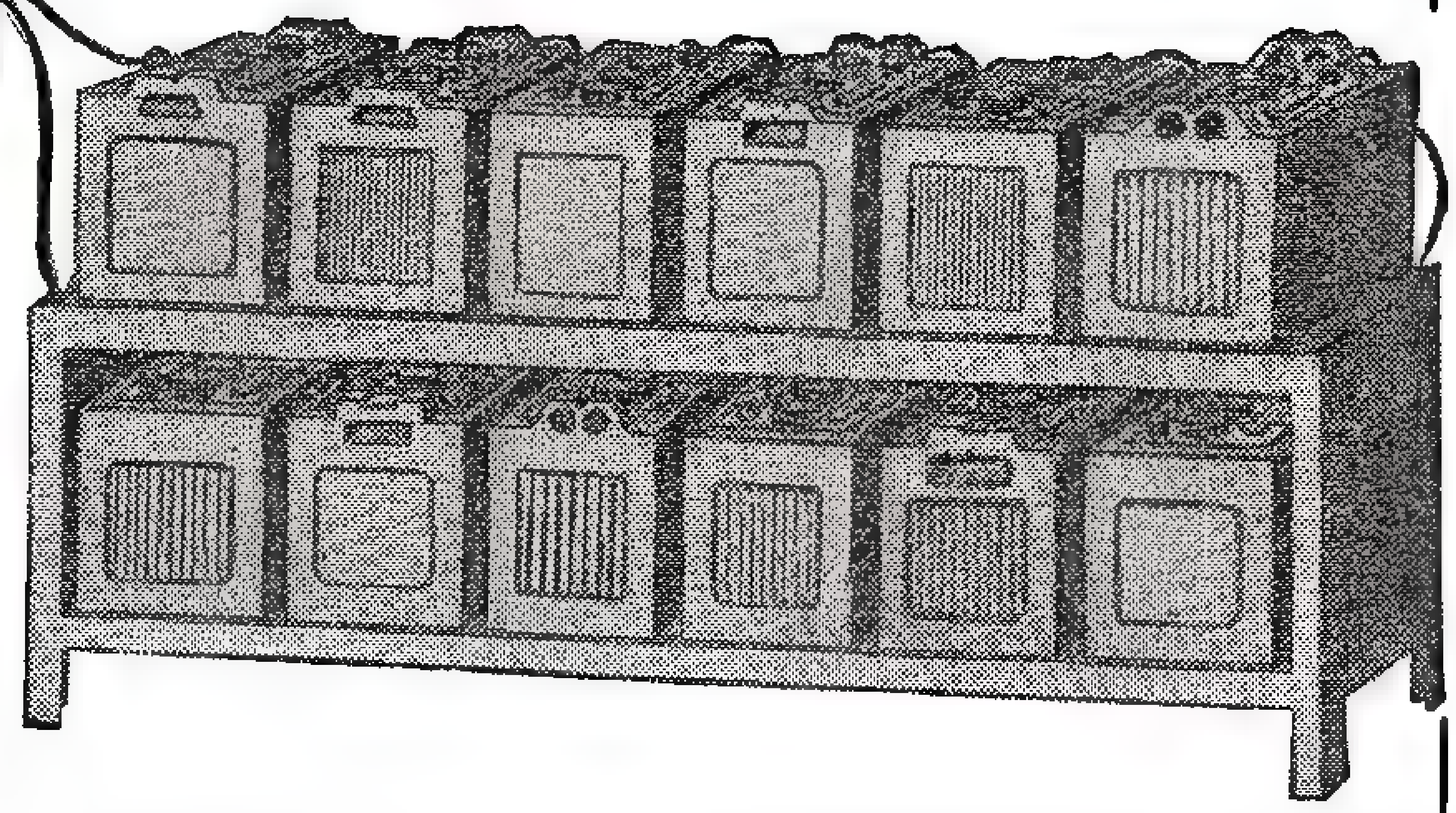
12 Battery CHARGER Only $19.75

Sturdily constructed Battery Charger will give years of trouble-free service—now CHARGE BATTERIES and make the enormous profits this business pays.



Make Money DAY and NIGHT!

Yes, it's true! A big, professional, 12-battery-capacity, 6-ampere charger—FULLY GUARANTEED—only $19.75—only HALF the cost of old-fashioned chargers. The WONDER CHARGER, at many dollars less than the cost of any other 12-battery-capacity charger on the market, brings YOU and every garage, filling station, repair shop, tire and accessory shop an opportunity to make the BIG PROFITS of battery-charging service. More than 40 million autos, trucks and buses in America need battery-charging service regularly. Don't turn this business away. Install the WONDER CHARGER at only a fraction of the cost of old-style, high-priced equipment at once!

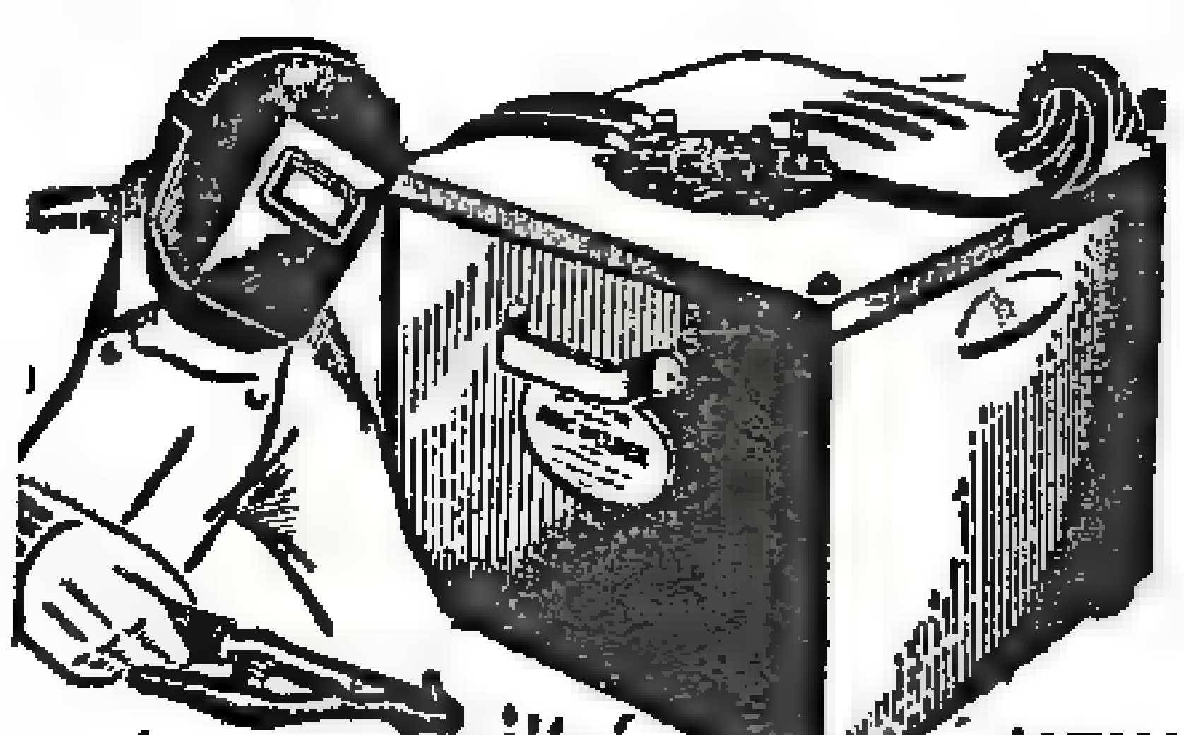


Every Battery Means 75c to $1.50 for You

Battery-charging service is almost ALL PROFIT! Because it requires a minimum of time, labor and attention from employees, it costs little in operating power, yet *brings you cash profits as high as 800%!* Now you can stop sending customers and their money to competitors. Now you can keep these big *profits*—hundreds of steady extra dollars every year—*right in your own shop!* Day and night, Saturdays, Sundays and holidays, too, WONDER CHARGER works away, making big, easy profits for you. Helps you give customers the service and satisfaction that builds good will and a growing, profitable business. Mail the Coupon for details NOW.

RUSH Coupon For FREE FACTS

The WONDER Battery Charger is a big, sturdy, welded-steel-construction machine. Greatest charging efficiency at lowest power cost. Operates from ordinary light socket, 110-Volts to 125 Volts, 50 or 60 cycle. Measures 11" by 11" by 12½". Weighs 35 pounds complete. Takes small space—brings BIG PROFITS. Completely charges up to 12 batteries in 18 hours—PROFIT of up to $8.00 a DAY. Has accurate ammeter and embodies every feature of higher priced charger for long, dependable, trouble-free service. Should pay for itself first week! Mail the Coupon for sensational facts.



NEW ELECTRIC ARC WELDER

$39.25 Complete with Accessories

Now easy to add hundreds of dollars to your profits. With Aladdin Electric Arc Welder, you can do all types of heavy and light welding; motor blocks, fenders, axles, frames, bodies, gears, bumpers, etc. Works from 110 or 220 Volt Socket. Costs only few pennies an hour to operate. Experience not needed. Check coupon for FULL DETAILS.

EXTRA PROFITS!

RELIANCE ELECTRIC PIPE THAWER

Thaws any frozen pipe in 1 minute! Clean up extra profits this winter with Reliance Pipe Thawer—costs only $39.25 complete—does work of machines costing up to $3,000. Make $2.50 to $15.00 a job. Check coupon for details.

COMMONWEALTH MFG. CORP.

3785 Beechmont Ave., Dept. P-206, Cincinnati, Ohio

COMMONWEALTH MFG. CORP.,
Dept. P-206, Cincinnati, Ohio

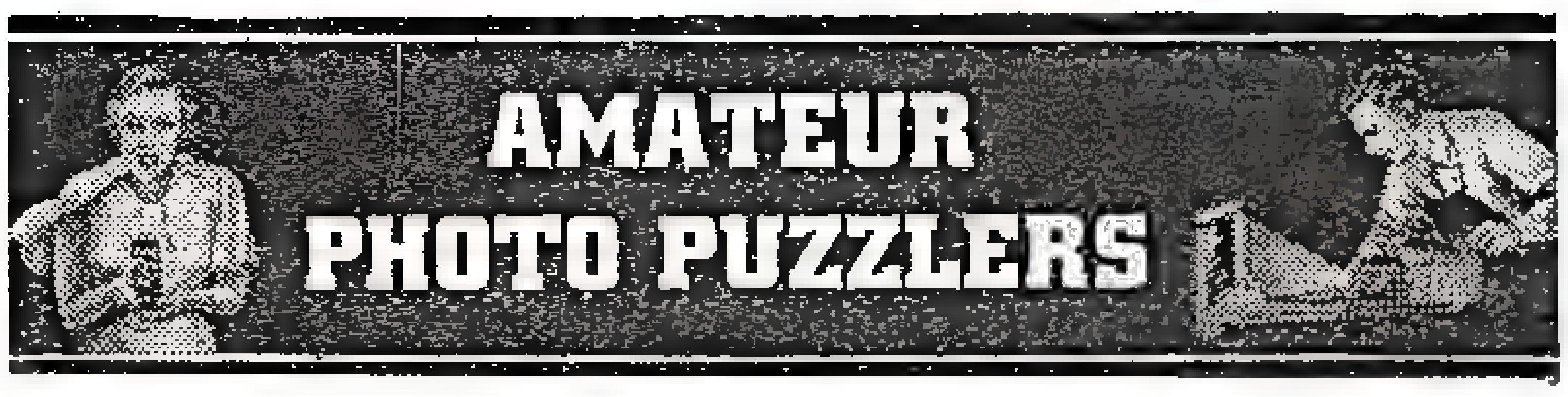
Please rush details of WONDER BATTERY CHARGER, without obligation. Also for machines checked below:

☐ ELECTRIC ARC WELDER
☐ PIPE THAWING MACHINE

Name ....

Address ....

City ....State ....



AMATEUR PHOTO PUZZLERS

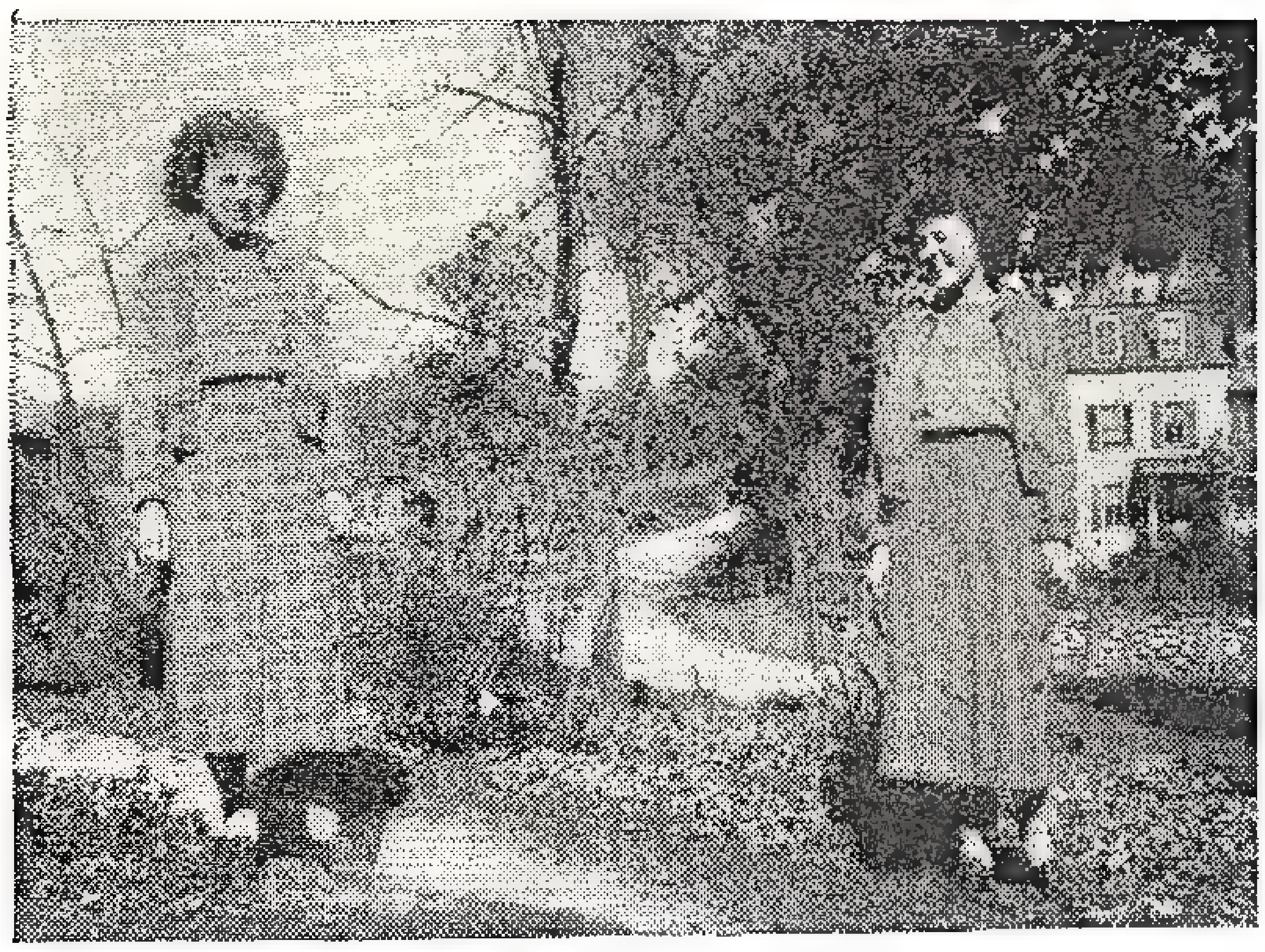
In this department the Photography Editor will answer any question or problem related to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope in case space does not permit publication of the question and reply on this page. Send all inquiries to the Photography Editor, Modern Mechanix Hobbies & Inventions Magazine, *22 West Putnam Avenue, Greenwich, Connecticut.*

MAKING A COPY OF SNAPSHOT PRINT

I have a small snapshot picture which I treasure very highly. I would like to secure an enlargement of this picture, but since I no longer have the negative I have been in doubt about the possibility of this. Since I know very little about photography I am wondering if you can enlighten me on this matter. —Grace Cook, Dover, Delaware.

Good enlargements up to 8 by 10 inches can be secured from small snapshot prints simply by photographing the snapshot on a fine grain film and enlarging this film to the particular size desired. Any photographer can do this work for you. The cost is nominal.

TRICK PHOTO RECEIVES $5 AWARD



By exposing one half of the film at a time with a "duplicator" Harvey Herdman, Branchville, N. J., secured this unusual picture. The girls are not twins, but one and the same person. For his clever photography Mr. Herdman receives $5.00.

ACTION PICTURES WITH BOX CAMERA

Is it possible to take action pictures with a box camera? Last month I attempted to take pictures of some of the exciting plays during our school's football season, but the results were very disappointing. What kind of camera should be used for taking action pictures?—David Rendown, Philadelphia, Penna.

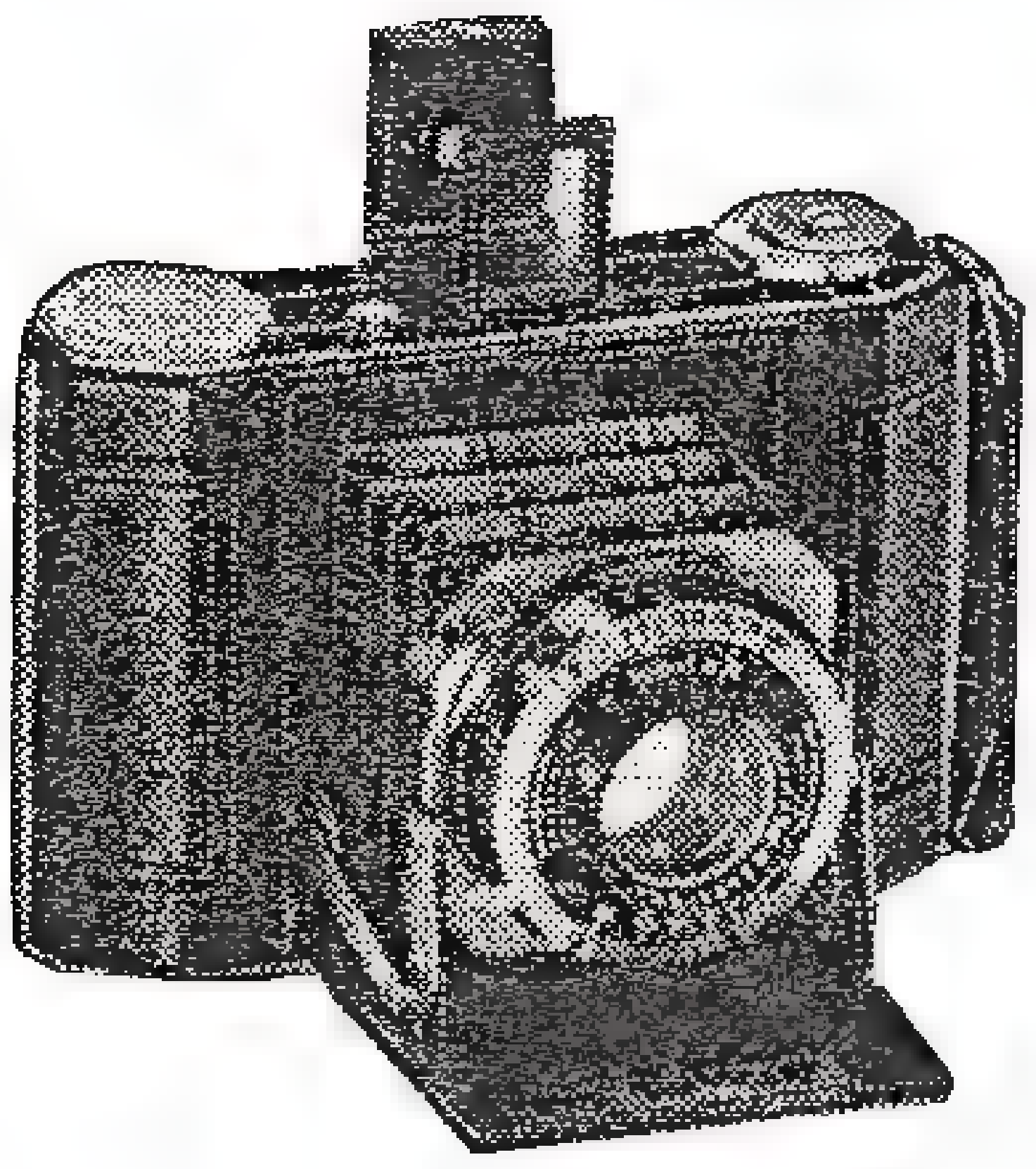
Action pictures cannot be taken with a box camera since it is fitted with a lens that is entirely too slow for the purpose. Action pictures, if they are to be clear, must be taken with a camera having a f.2 or faster lens. The usual box camera lens is an f.8 which is, as you can well see, too slow for recording action scenes.

The photograph editor will pay $5.00 *or* $3.00 *each for photographs interesting enough for publication on this page. All pictures should be mailed to Modern Mechanix Publishing Co., Greenwich, Conn.*

Kodak

FOR THOSE WHO LIKE THEM SMALL

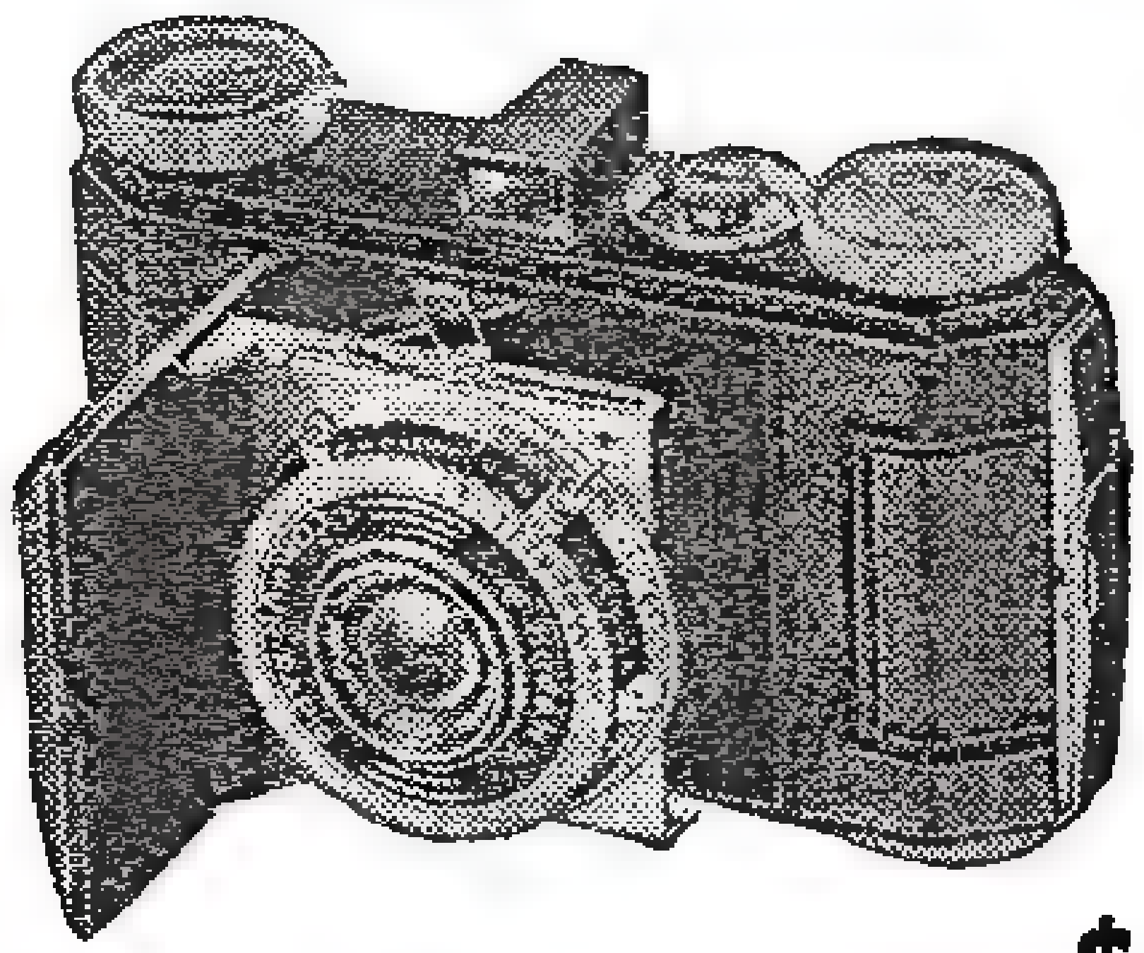
Miniature Kodaks



$57.50

KODAK DUO SIX-20

A true "miniature"; compact, finely built, yet it takes 16 album-size pictures (1⅝ x 2¼ inches) on a roll of Kodak Film (four types available). Negatives are sharp; give big, clear enlargements. Shutter, 1/500 Compur-Rapid. Lens, Kodak Anastigmat ƒ.3.5. Price, $57.50.



KODAK RETINA $57.50

Concentrated photographic versatility . . . lens, anastigmat ƒ.3.5; shutter, Compur-Rapid—9 speeds up to 1/500 second. Loads with any of five different Kodak Film Magazines (including new Kodachrome for full-color transparencies). Negative size approximately 1 x 1½ inches. Price, $57.50.

KODAK BANTAM SPECIAL

This exquisitely made "miniature" fits the hand. Lens, Kodak Anastigmat EKTAR ƒ.2.0. Shutter, 1/500 Compur-Rapid. Military-type range finder, coupled with focusing mechanism. Makes needle-sharp negatives for superb enlargements (low-cost size, 2¼ x 4 inches); or Kodachrome transparencies. Price, $110.

$110

Christmas Guide

FOR THOSE WHO LIKE THEM LARGER

Precision Kodaks

KODAK SIX-16 (f.4.5)

Smallest folding camera taking 2½ x 4¼-inch pictures. *F*.4.5 lens; 1/400 Compur-Rapid shutter. Price, $40. (With *f*.6.3 lens, $20; with Doublet lens, $16.)

$40

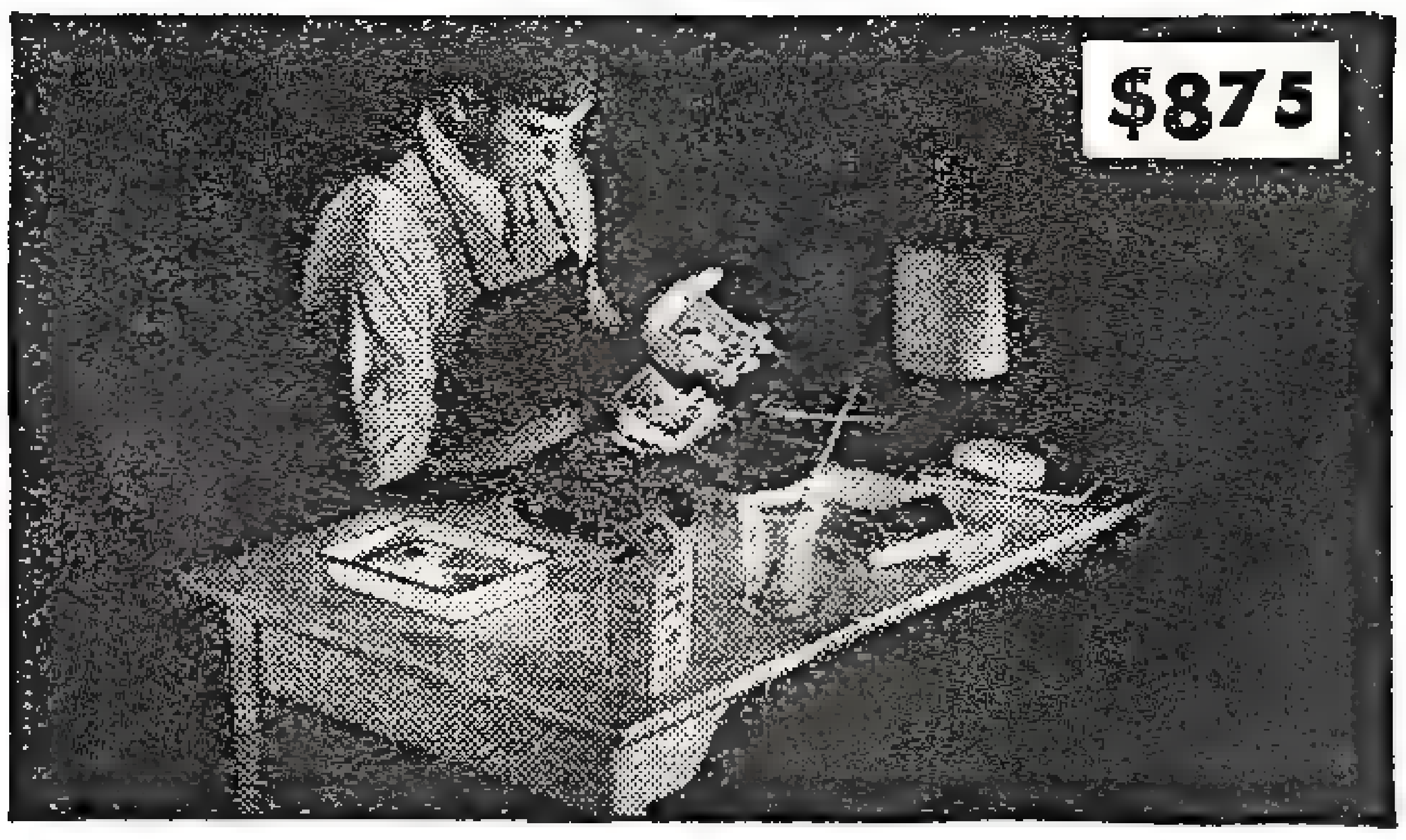
KODAK RECOMAR 18

Advanced amateurs delight in its *f*.4.5 lens, 1/250 Compur shutter, self timer, ground-glass focusing back. Loads with film packs, cut film, plates. 2¼ x 3¼. Price, $54.

$54

KODAK DARKROOM OUTFIT NO. 1

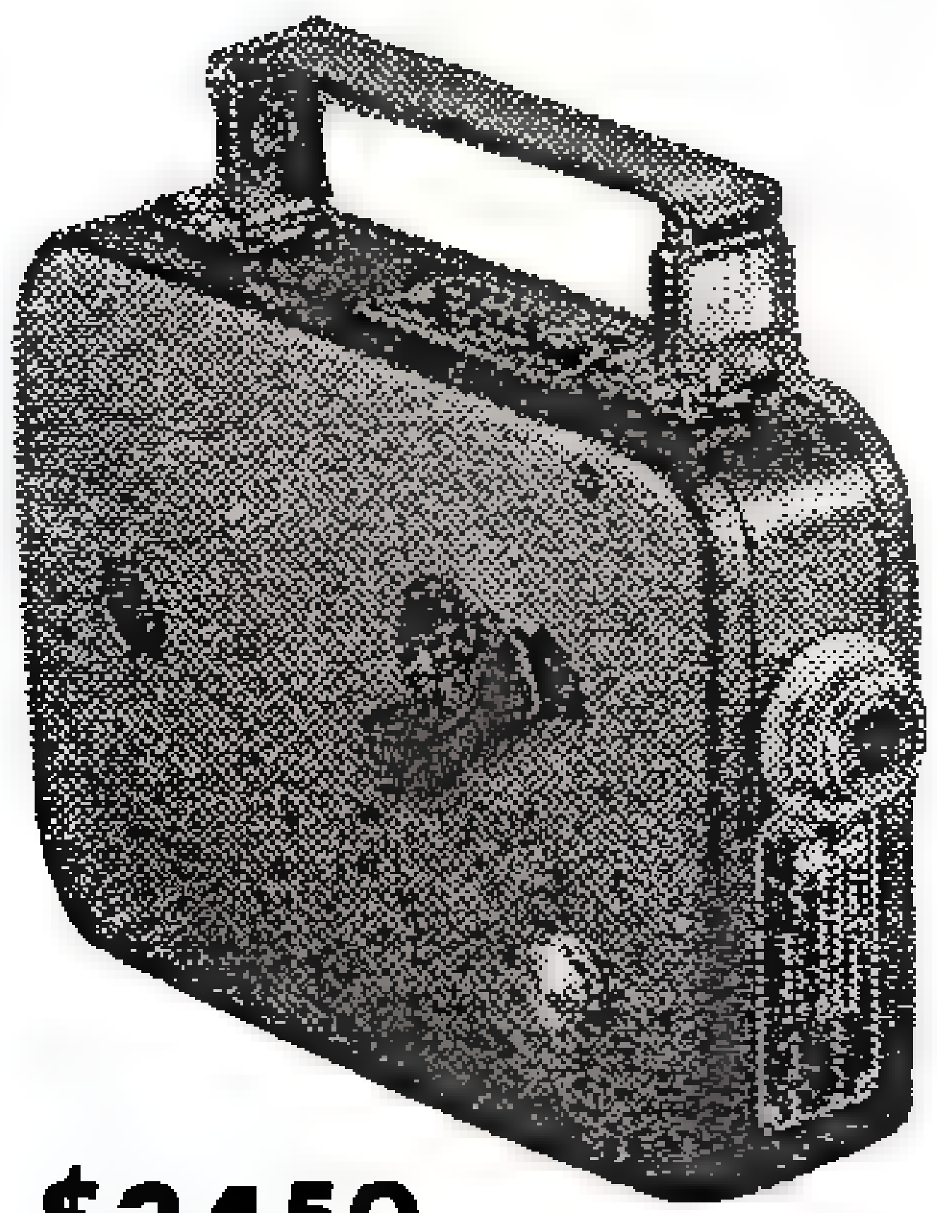
Contains trays, chemicals, developing clips, safelight, printing frame, thermometer, instruction booklet—everything necessary for first-class work. Also includes the book, "How to Make Good Pictures." Price, complete, $8.75.



$$8^{75}$

FOR THOSE WHO WANT MOTION

Ciné-Kodaks



CINÉ-KODAK EIGHT

Movies at "10 cents a shot"! The "Eight" makes it possible. A roll of Ciné-Kodak Eight Panchromatic Film costs only $2.25, *finished, ready to show*. Good for 20 to 30 black-and-white movie "shots," each as long as the average scene in the newsreels. Price, $34.50.

$$34^{50}$

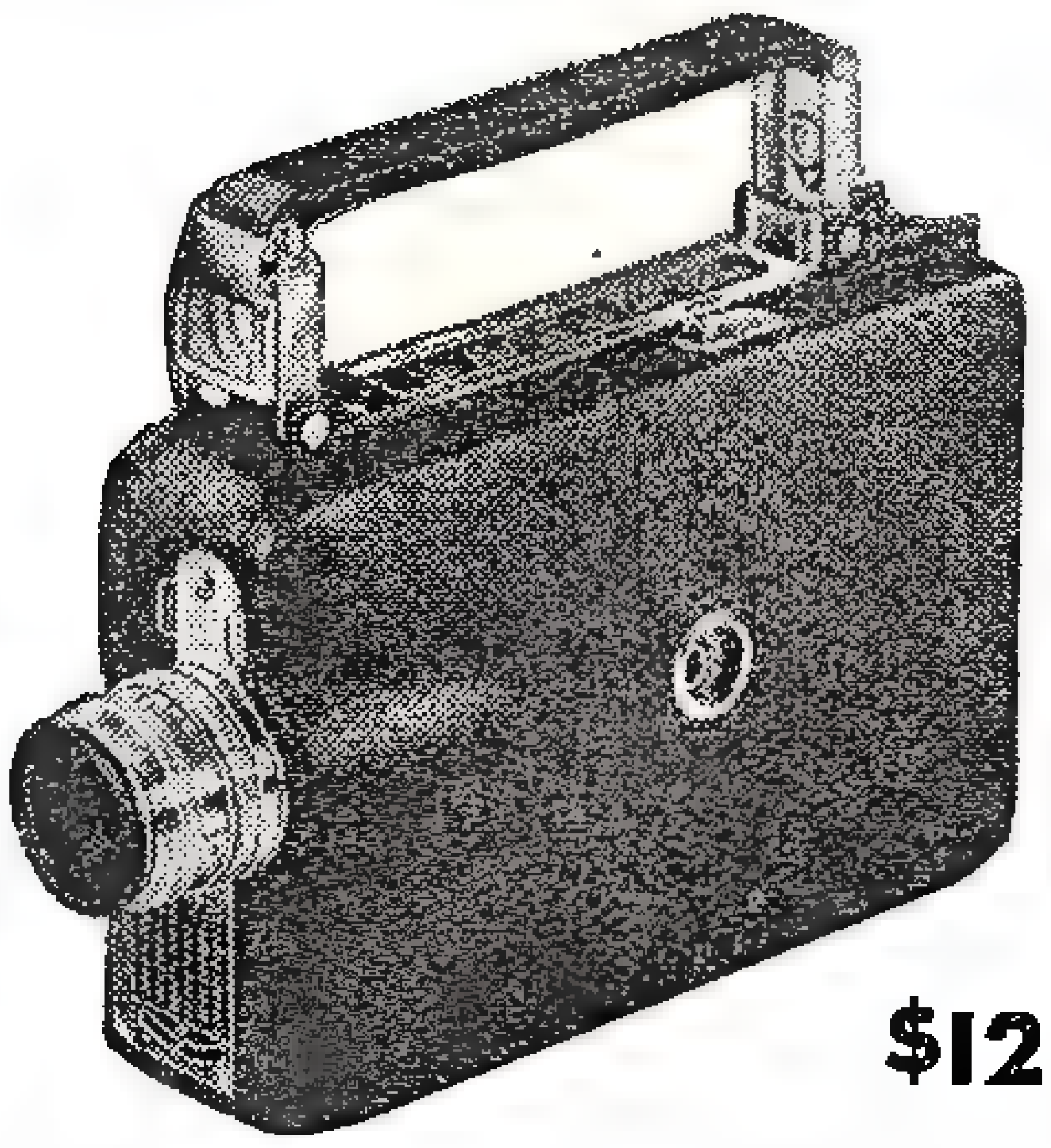
CINÉ-KODAK "K"

Most widely used 16 mm. home movie camera—it's so simple, yet so fine. Makes clear, brilliant movies at the touch of a button. And as the user's skill increases, responds to every exacting demand. Loads with full 100 feet of 16 mm. film. With *f*.1.9 lens, $112.50.

$$112^{50}$

MAGAZINE CINÉ-KODAK

Loads in 3 seconds. Slip in the magazine, close camera cover, and shoot. And you can switch to another film in a jiffy, even when but part of the 16 mm. film has been exposed. Effortless loading is only one of six new features. With *f*.1.9 lens, $125... Eastman Kodak Company, Rochester, N. Y.



$125

ALL CINÉ-KODAKS MAKE FULL-COLOR MOVIES ON KODACHROME FILM

Behind The Razor Blade

[*Continued from page* 61]

breakdown. The dies these men produce are accurate to one ten-thousandth of an inch.

After perforating, the blade strip is gauged for centrality—a measurement from the center slot to either edge. This distance must be held constant. The importance of accuracy here can scarcely be over-emphasized, since centrality of the slot controls the proper positioning of the blade in the razor.

Since the hardening process requires a surface absolutely clean, the coils of steel are "laundered" in the de-greasing machine immediately before entering the hardening furnace. The de-greaser passes the perforated coil through a soda wash, through high pressure jets of water just under the boiling point, through blasts of compressed air, a scrubbing box, a tank of special grease solvents, through jets of live steam, and finally compressed air again.

The razor blade makers were the first to recognize the fact that steel received from the rolling mill cannot be uniform, even in a single coil, and that to produce a uniform finished product, the temperature of the hardening furnace must fluctuate to compensate for these variations.

Since the furnaces maintain a temperature of approximately 1500 degrees Fahrenheit, and the difference between a good and a bad blade can be affected by a change of only 10 or 12 degrees, the control for the hardening furnace must be extremely sensitive and entirely automatic.

A "magic black box," situated midway of each furnace, furnishes this automatic control. A master strip of steel of exactly the correct temper is inserted in this box. If the steel in process does not match this master strip exactly in hardness, the magic box flashes an impulse to a control panel regulating a battery of automatic switches, and the amount of electricity flowing to the furnace is altered the required amount to bring the steel to the desired standard.

It is in the hardening furnace that the distinctive blue effect of a blade is obtained. A patented apparatus feeds a special mixture of gases to the furnaces, and the blue becomes part of the steel itself.

As the strip of steel leaves the hardening furnace it passes through the tempering plates that make the center section easy to flex when the blade is placed in the razor. A coat of rustproofing oil is then applied before the coil is rewound.

Samples are broken off of each coil after it leaves the furnace, to be submitted to a hardness test under a diamond-pointed instrument. If a sample fails to meet the required standard the whole coil is rejected and the furnace is stopped until the trouble can be found and remedied.

These samples are then sent to the cathode ray oscillograph—the electro-magnetic tester previ-

NOW LISTEN, LARRY —YOU CAN'T BACK OUT!
NEXT DAY
TAKE IT FROM ME, LARRY—THESE YEAST CAKES ARE SLICK STUFF TO FINISH OFF PIMPLES—JUST YOU START EATING 'EM RIGHT OFF!
GEE CHARLIE—YOU SURE ARE ONE SWELL GUY!
LATER
HEY CHARLIE—TAKE A SQUINT AT MY FACE—THAT FLEISCHMANN'S YEAST WORKED
WELL I TOLD YOU IT WOULD CHASE THOSE BLOSSOMS—DIDN'T I ?
SAL
IUM

ously described. Variations of hardness and temper, or any hidden flaws or strains, are revealed here by a green line of light flashing on the fluorescent face of the oscillograph cathode ray tube. So accurate is this device that the passing of a sample through the flame of a match will cause a variation of hardness great enough to bring about a rejection. Next is a bending test to make sure the center of the blade will flex in the razor.

Having passed these tests, the coil of steel, now perforated, hardened and tempered, is run through a series of delicate gauges, to again determine that the breadth, thickness and centering are uniform.

The approved steel is again passed through the "laundry," after which it goes to the etching machines, where the trade mark and other distinctive lettering are etched on the metal with acid.

After another examination, the coil is sent to the sharpening machine. Two sets of grinding wheels, one for each edge, first remove the rough stock. Next the honing wheels, cutting at a different angle from the grinders, produce a perfect bevel on each edge.

After being honed, the blades are washed clean and dried with compressed air before passing on to the stroppers of specially tanned leather. Each blade is finished on 280 feet of sharpening surface while passing through this machine.

Inspectors stationed at the ends of the finishing machines submit their blades to tests with microscopes and gauges, finishing the test by cutting hair with the blades.

Samples from the finishers are also sent continually to the laboratory for examination by a photo-electric sharpness comparator. This machine measures the area of the blade edge with a beam of light. As the light traces down the length of the blade, a dot is thrown on a ground glass.

With cross-section paper placed over the glass, a girl traces a graph of the blade's edge. If the graph is straight, or nearly so, the blade is satisfactory. If it is saw-toothed, irregular, something is wrong with the grinding machine. That machine is stopped immediately, and the blades it has finished must be rejected.

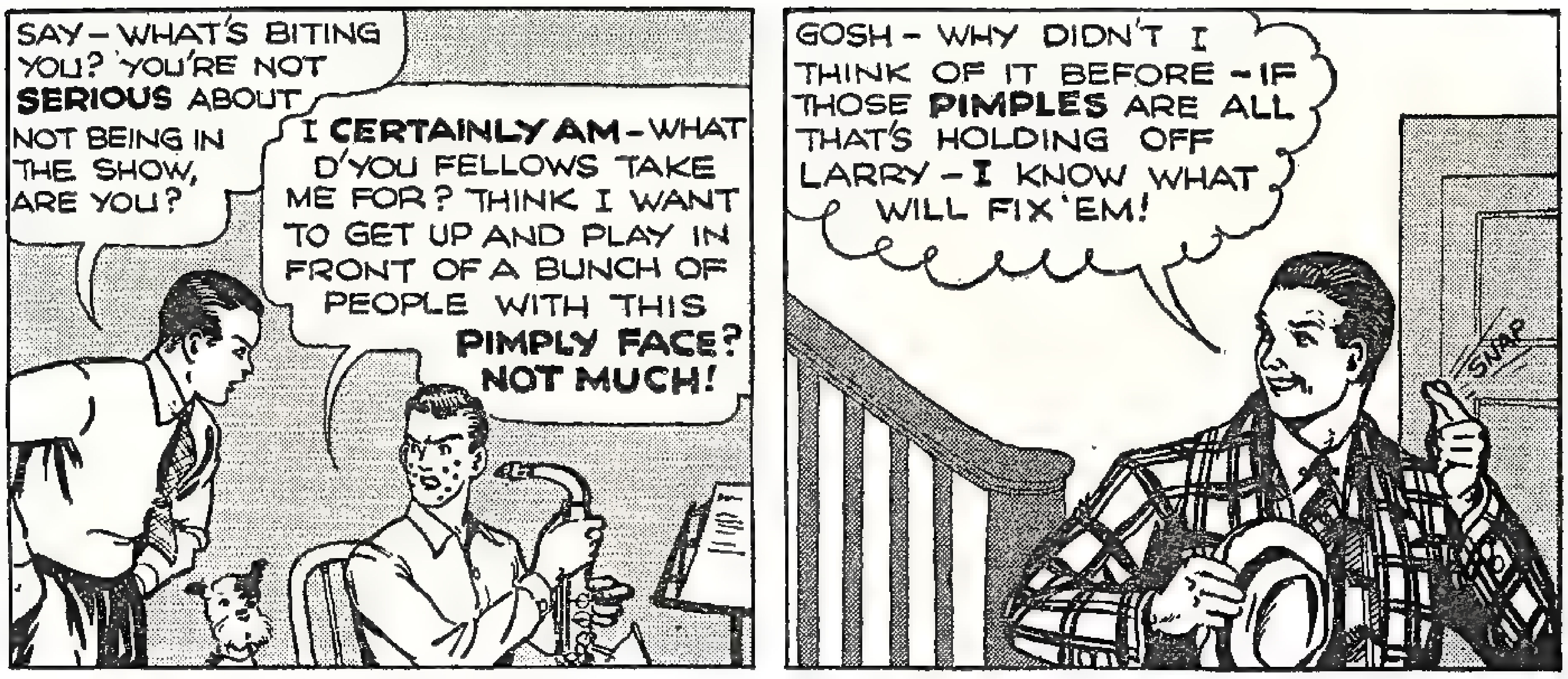
The finished blades now go to a room which at first glance you would take to be a library. Girls are studiously pouring over, not books, but stacks of blades. Every blade that leaves the factory is inspected by these girls.

After passing this last barrier the blades are sprayed with a powerful antiseptic solution, after which they are immediately wrapped, sealed in a wax-paper envelope and an outside wrapper.

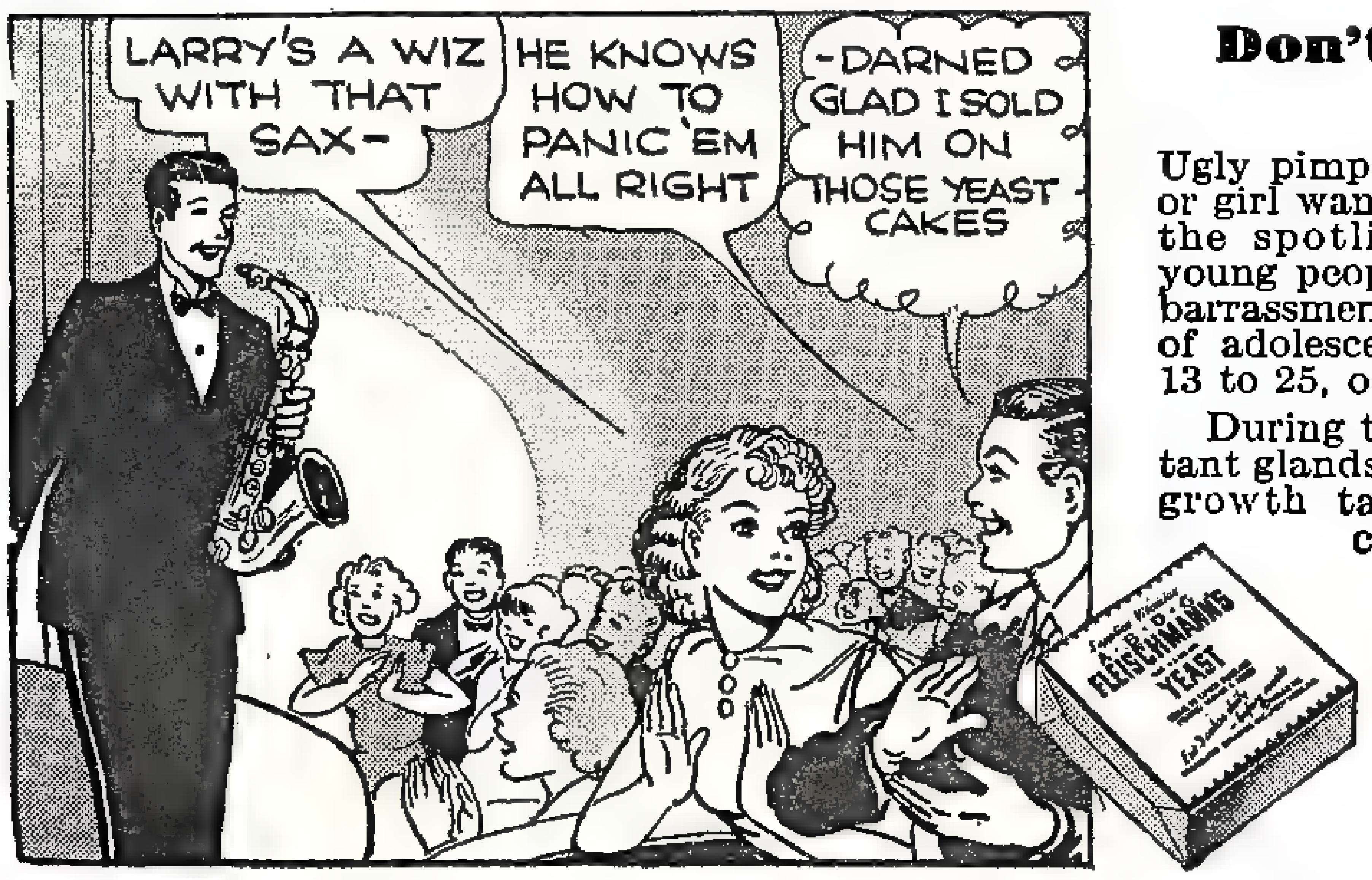
In an endeavor to improve its product the Gillette Company has several inventors on salary, constantly working on new developments for the razor and blade.

And all so you won't wear whiskers.

READ HOW LARRY'S PIMPLY FACE ALMOST MADE HIM QUIT THE SHOW



SAY—WHAT'S BITING YOU? YOU'RE NOT SERIOUS ABOUT NOT BEING IN THE SHOW, ARE YOU?
I CERTAINLY AM—WHAT D'YOU FELLOWS TAKE ME FOR? THINK I WANT TO GET UP AND PLAY IN FRONT OF A BUNCH OF PEOPLE WITH THIS PIMPLY FACE? NOT MUCH!
GOSH—WHY DIDN'T I THINK OF IT BEFORE—IF THOSE PIMPLES ARE ALL THAT'S HOLDING OFF LARRY—I KNOW WHAT WILL FIX 'EM!
SNAP



LARRY'S A WIZ WITH THAT SAX—
HE KNOWS HOW TO PANIC 'EM ALL RIGHT
—DARNED GLAD I SOLD HIM ON THOSE YEAST CAKES
FLEISCHMANN'S YEAST

Don't let Adolescent Pimples keep YOU from being a hit

Ugly pimples make any boy or girl want to steer clear of the spotlight. Yet many young people suffer this embarrassment after the start of adolescence—from about 13 to 25, or even longer.

During this period, important glands develop and final growth takes place. This causes disturbances throughout the system. The skin becomes very sensitive. Waste poisons in the blood irritate this sensitive skin. As a result, pimples appear.

Fleischmann's Yeast clears these skin irritants out of the blood. Then, pimples go. Eat 3 cakes *daily*—one before each meal—plain, or in a little water—until skin clears.

—clears the skin

by clearing skin irritants out of the blood

Copyright, 1936, Standard Brands Incorporated

TURN SPARE HOURS INTO CASH!

up to $40 Weekly In Your Own Home

No soliciting! No canvassing! We show you how to make big money decorating fast-selling Giftwares. We start you with the big $10 Artist's Outfit shown above. We supply you with $150 worth of Giftwares free of extra charge and show you how to dispose of them without leaving your home. We give you 20 Tested Plans for making money. One Fireside Member says, "I made $100 on furniture in one week." Another writes, "My sales were $500 for 5 weeks. This is my first year." R. M. P., of Ill., says, "I did $3.500 worth of business last year and over $12,000 this year." D. W., New Mexico, reports, "I would not take $1,000 for my Course."

No Experience Needed

You too may have a **guaranteed income** opportunity with Fireside. No tiresome study. You learn by doing. No artistic ability necessary. Our easy 3-Step Method makes the work easy to learn and easy to do and fits you to make good money practically from the start.

Quick Sales in Your Home

No need to leave the house to dispose of everything you make. Our new automatic salesman does all the selling for you. Designed to quickly find cash buyers for all the Giftwares you can turn out.

No Cost Plan

Send coupon for details of new plan that pays for your Fireside Course besides putting big cash profits in your pocket. Mail coupon now while openings for new members are still being offered.

FIRESIDE INDUSTRIES
Dept. 142-A
Adrian, Mich.

FREE! Book on decorating at home for big money. Tells how to get big assortment beautiful Giftwares free of extra charge.

Fireside Industries
Dept. 142-A, Adrian, Mich.
Send me FREE Book on Home Decorating for a big steady income. Also details of plan that will pay for my Course and give me big profits besides.

NAME ....
ADDRESS ....
CITY ....STATE ....

Salt Water Fishing Tackle

[*Continued from page* 78]

jerked on the water surface, boiling up the same in a most tempting fashion. Robalo, sea trout, kingfish, Spanish mackerel and others attack such surface lures with a ferociousness that is little short of spectacular. It is an excellent idea to have a 10-inch gimp wire leader connected to the lure to stall off the possibility of the teeth of the fish connecting with the line.

There seems to be a belief with some that gut leaders are suitable for protection as between the end of the line and the lure. Gut leaders, however thick, should never be used. Steel wire No. 8 to 10 is generally selected from which to cut leaders ranging from three to five feet in length. Bronze wire size .022 is also much in use.

The cuttyhunk type of line is without doubt the favorite in most sea fishing locations on all coasts. These lines are composed of a number of threads, 18, 21, 24, 27, 30 or as the case may be. The 18-thread line contains 18 threads, and so on. The better grade of cuttyhunk line has a dry test of 2½ pounds per thread. According to this the 18-thread line will test to 45 pounds, and the 30 thread line, 75 pounds. It is necessary to know this in selecting your cuttyhunk lines.

Aside from the fact that the black bass casting rod and the plug lures are used in the inshore waters, around the reefs and river mouths, and in such places where the small sized to medium sized fish often hold out, it may be said that the medium sized to the large fish are almost always trolled for. This trolling is carried on at a rather faster rate of speed than that in fresh water.

A method of deep-sea fishing that is much in vogue wherever sea fish are taken is that of still-fishing. This involves anchoring the boat off sunken ships, submerged reefs and rocks, around pilings and old piers, and there contacting the mighty. This is a favorite method of fishing for the jewfish, the tremendous finny one which is likely to go into the hundreds of pounds in weight. For jewfish (also called sea bass by some), it will be found that a hand-line, 24 to 36 thread, is excellent, although some lines, little short of young ropes, are also used. The hook should be 10-0 to 12-0, shark size, and the bait either a live fish or large cut bait.

A method of fishing that is little short of an institution along the upper Atlantic coast, and is becoming increasingly so along the Florida coasts, the Gulf and the Pacific is surf fishing, which calls for a specialized tackle. One wades the surf and casts out.

A piece of strip cut bait or half a mullet is generally used for bait and is impaled on a No. 10-0 hook. It is cast and allowed to sink to the bottom where a wait is made for a strike. If a fish is felt at the lure, the line should be fed out, permitting the fish to obtain a good grip on the hook. The hook is then set with a powerful upward jerk of the rod and the battle is on.

RIGID TESTS PROVE QUALITY OF *Genuine* Ford Batteries

Genuine Ford Batteries undergoing the cold test in refrigerator where zero temperature is maintained, at the Ford Battery Testing Laboratory at Dearborn, Michigan.

These sensitive meters accurately measure battery capacities. The batteries in the tank to the right are undergoing a normal discharge test.

IMAGINE holding down the starter button on your car for eight minutes! Imagine discharging and recharging your battery 45 times with an overcharge of 100 per cent each time! Imagine overcharging your battery at a 10-ampere rate continuously day and night for thirty days!

Hard on your battery? Yes! Yet these are only a few of the severe laboratory tests that Genuine Ford Batteries, used in Ford cars and trucks, must pass. No wonder millions of Genuine Ford Batteries in service throughout the world have proved their ability to give long, trouble-free service—even on the toughest jobs.

Plates used in Genuine Ford Batteries are of the highest quality materials. They have exceptionally large areas. Only vertical-grain wood separators are used. Posts are fused to lead inserts in the cover to provide additional strength. And cell covers rest on ledges in the case to provide better support for the elements inside.

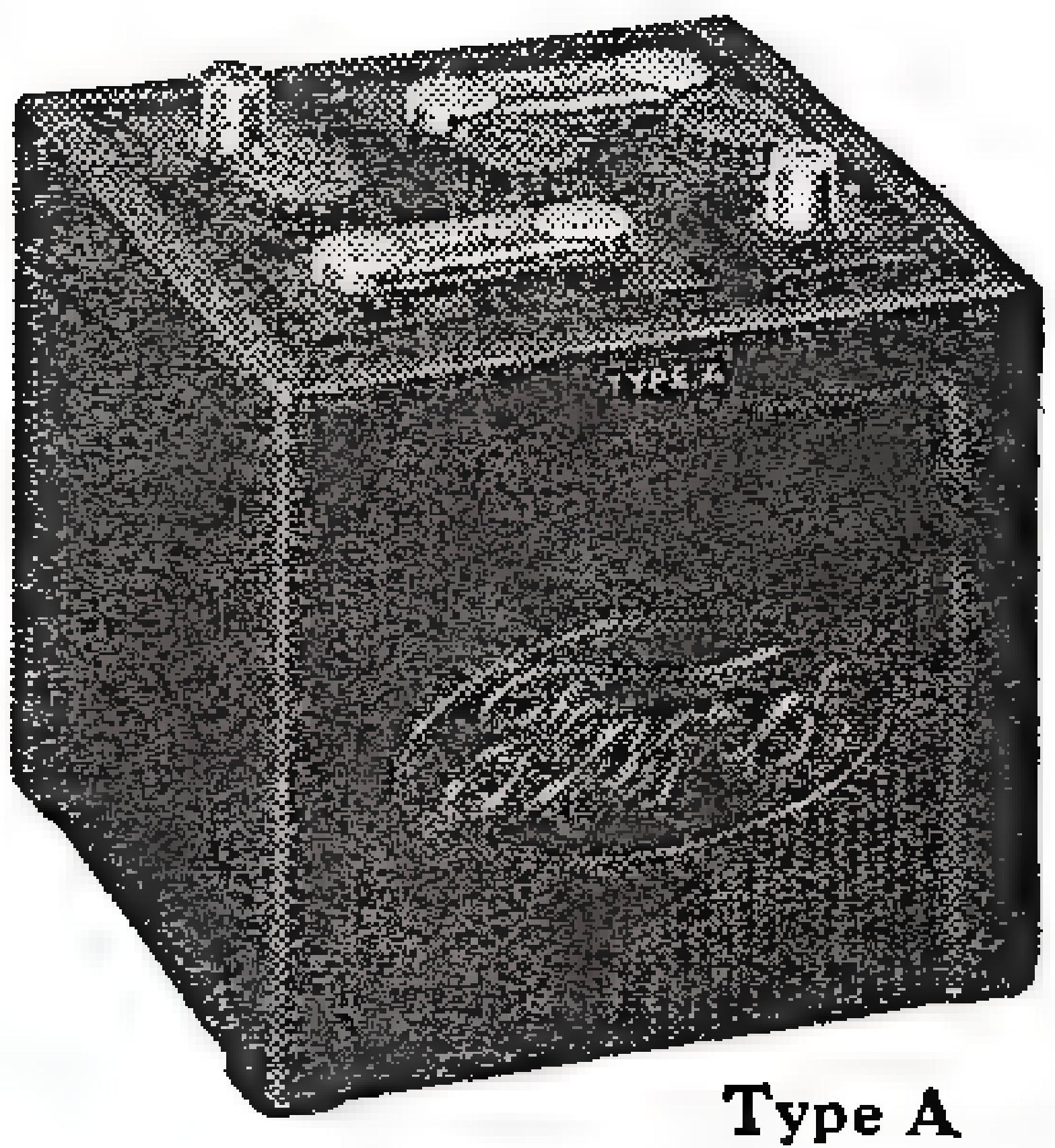
The high-rate discharge test—equivalent to holding down the starter button for eight minutes.

Regardless of the car or truck you drive, when your battery must be replaced, remember that with a Genuine Ford Battery you can be certain of Ford quality, Ford standards of workmanship and Ford rigid inspections and tests. You can be certain of genuine satisfaction.

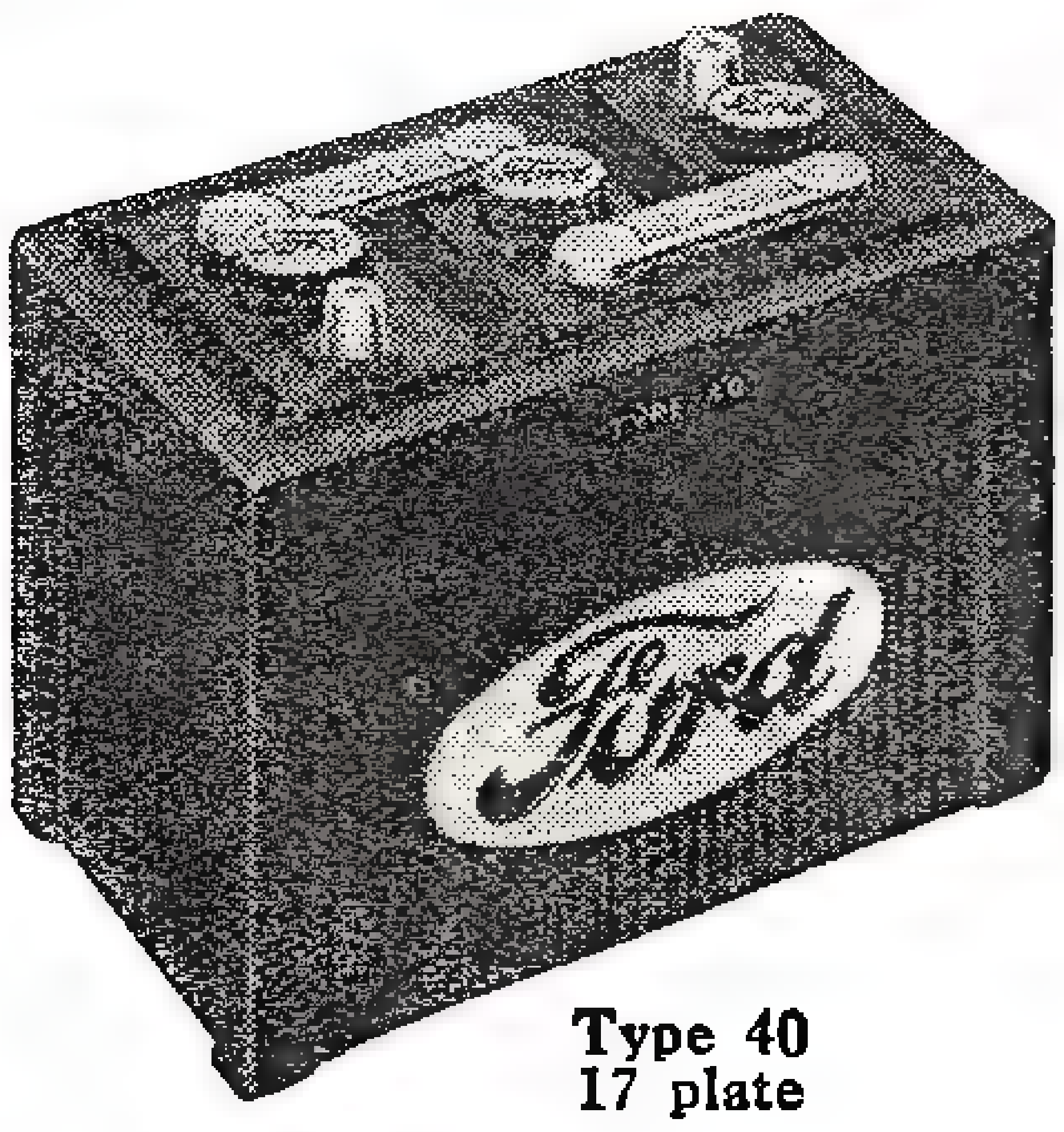
FORD MOTOR COMPANY • DEARBORN, MICHIGAN

GENUINE Ford PARTS & ACCESSORIES

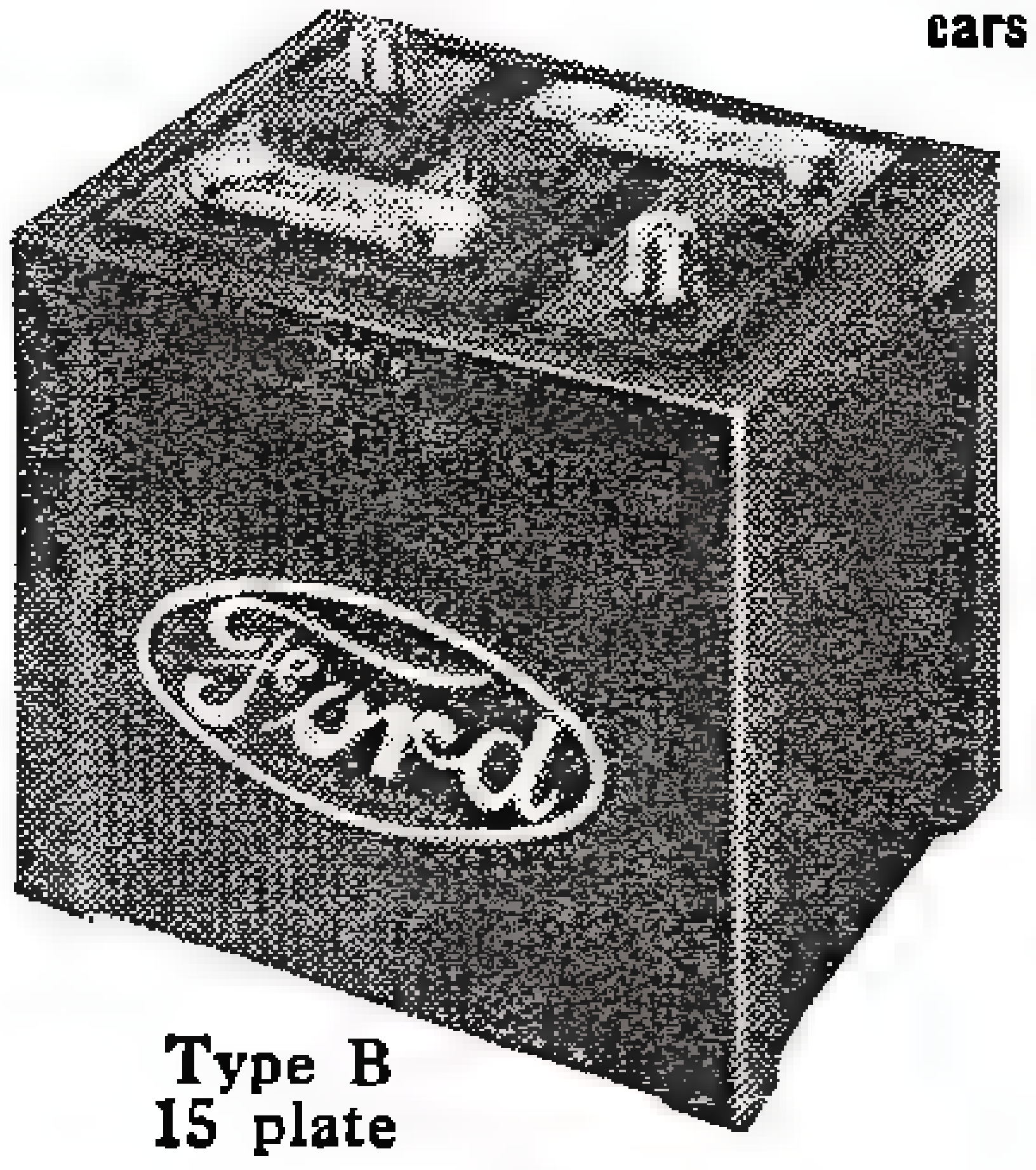
The complete line of Genuine Ford Batteries consists of a 13-plate battery, two 15-plate batteries and one 17-plate battery. The last is used as standard equipment in Ford cars and trucks.



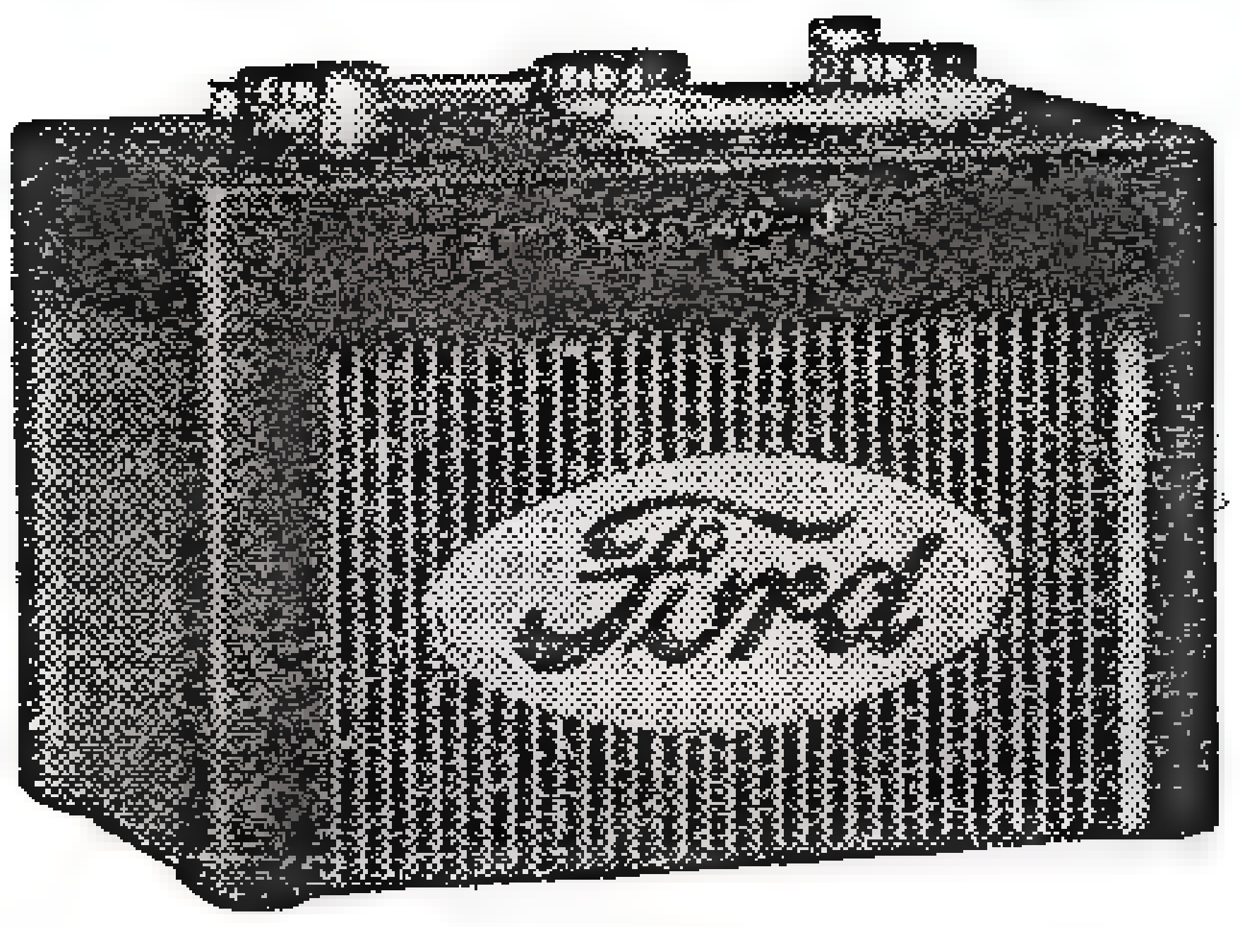
Type A
13 plate



Type 40
17 plate



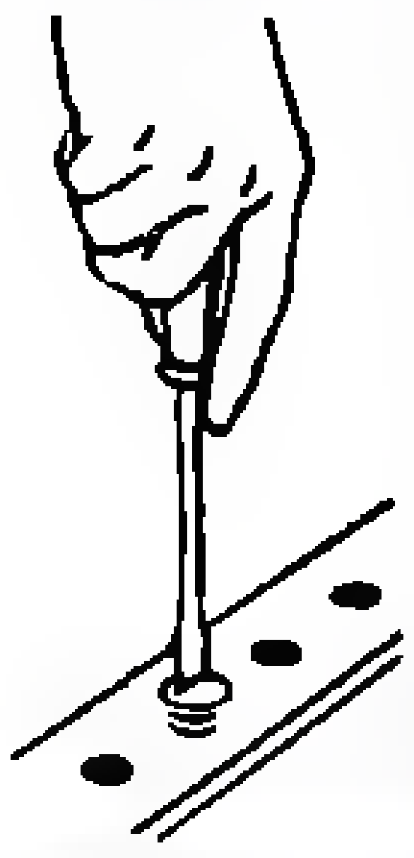
Type B
15 plate



Type 40-D
15 plate

AMAZING
INVENTION
ELIMINATES
ALL NEED FOR
costly taps!
Note
PATENTED
THREAD-
CUTTING
SLOT

SHAKEPROOF TAPPING SCREW
actually cuts threads in any material!

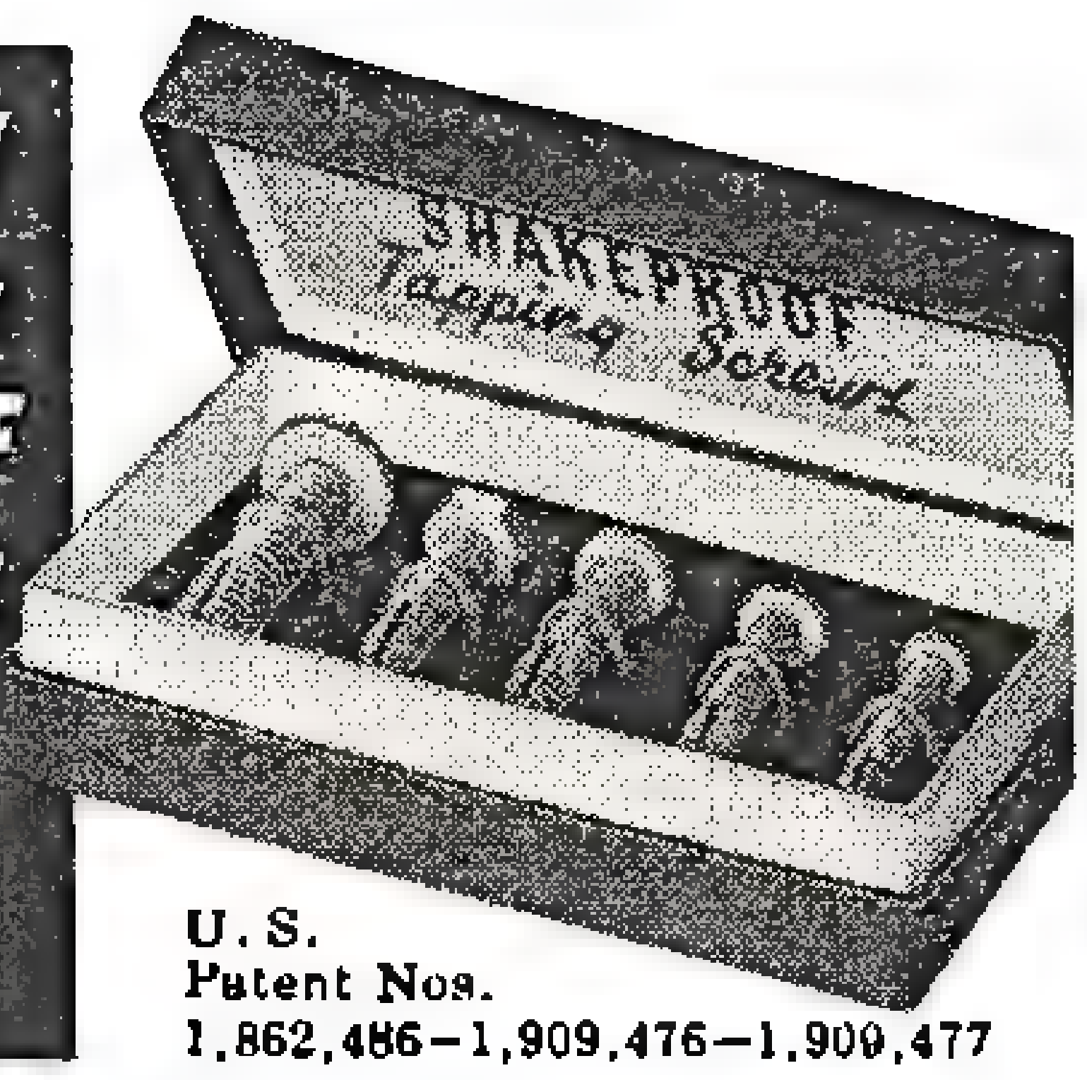


Now, it's no longer necessary to buy expensive taps. Shakeproof has produced a Tapping Screw that cuts a perfect thread and costs a fraction of the price. Easy to use, too. Just punch or drill a hole—insert tapping screw and turn home with a screw driver. Unscrew and you have a full, clean-cut thread—that's all there is to it!

Standard Machine Screw Thread

Each Shakeproof Tapping Screw has a standard machine screw thread. Its spring-action slot, plus a special hardening process, makes it an efficient, economical, cutting tool. Why buy costly taps?

SPECIAL
COMPLETE KIT OF 5 POPULAR SIZES
Postpaid for only 25¢



U. S.
Patent Nos.
1,862,486—1,909,476—1,909,477

Think of it—a whole set of Shakeproof Tapping Screws, packed in a neat, hinged cover container, delivered post paid to you for the price of a single, small size tap. Order a kit today. You get one each of the following sizes: 6-32; 8-32; 10-24; 10-32 and 1/4"-20—together with full information for using, including drill sizes for holes in metals and other materials of varying thickness. Take advantage of this offer!

CAN BE USED OVER AND OVER AGAIN!

You'll be amazed at the long life of Shakeproof Tapping Screws. Even after repeated use in materials of practically any thickness, the cutting edge retains its keen sharpness. Clip coupon and mail today with 25c for your kit. You'll say it's the biggest value a quarter ever bought.

FREE *Handy 10¢ Ring* **SHAKEPROOF LOCK WASHERS**

Mail coupon with 25c (coin) and we'll include, without charge, a handy 10c ring of Shakeproof Lock Washers holding an assortment of both external and internal types. Their famous tripple-action lock holds nuts and screws absolutely tight in spite of the most severe vibration. Used by leading manufacturers. Now sold by hardware dealers, mill supply and auto parts jobbers. Mail order now.

SHAKEPROOF LOCK WASHER CO.
Distributor of Shakeproof Products Manufactured by Illinois Tool Works
2521 N. Keeler Ave. Chicago, Ill.

CLIP COUPON—MAIL TODAY

SHAKEPROOF LOCK WASHER CO.
2521 N. Keeler Ave., Chicago, Ill.
Enclosed find 25c (coin) for which send me complete kit of 5 Shakeproof Tapping Screws and include a handy 10c ring of Shakeproof Lock Washers FREE.

Name..............................
Address..............................
City..............................*State*..............................

Generator Makes Gas

[*Continued from page* 108]

manner depicted in the diagrams. Use a fifty-gallon oil drum for the large tank and another, slightly smaller, that will fit inside. To the bottom of the small tank attach an eye bolt so that it can be raised from time to time by an overhead pulley arrangement. The top of the small drum is cut off, as is the top of the larger one. A length of one-inch pipe is installed in the large tank as shown in the accompanying diagrams. The pipe is cut so that it projects several inches above the top of the drum. After assembling the pipe and installing it in the tank, fill it with water to within a few inches of the top. Be careful that no water is allowed to enter the pipe when doing this.

Connect up the vaporizer unit and half fill it with gasoline. Connect a gas appliance to the nipple on the one-gallon tank and the gas generator is about ready for operation. Opening the air inlet valve on the smaller tank raise it out of the water filled tank, close the valve and allow it to lower into the water once more. The weight of the steel drum will cause the air inside to compress and pass down through the pipe then on to the vaporizer unit, where it mixes with the gasoline to form an illuminating gas.

The apparatus is not only an efficient gas generator from the standpoint of expense, but a safe one as well. Gas generated by it is no more dangerous than city gas. The only attention which must be given the gas maker is the raising of the smaller drum when it drops down and adding of more gasoline from time to time. Before raising the tank always open the air inlet, closing it again after the raising operation.

Let Sound Tell The Story

[*Continued from page* 72]

By tempo and musical "timing" the audience may be excited or lulled into "earical" pleasures. Musical tempo is used for speeding up the action of the cartoon story when things rapidly happen. To do this a slow musical tempo is played as a background music until the tempo or "time" is established with the audience, and then the "time" is gradually increased. This literally sucks the audience along in what the Disney artist calls a "musical vacuum."

When bugs march off to battle in a pseudo serious portrayal of a march, four-four time is used, while six-eight time is used for swinging comedy marches. Two-four time is used for "background" music where there are "chases" or where music with a definite beat in which the action is gradually speeded. Three-four waltz time serves for scenes where beauty is emphasized.

Music and sound has become an exact science with Walt Disney. The music and sound effects in his cartoon psychologically tell the film story for the ears as the picture on the screen does for the eyes.

AND NOW FOR ONE OF THOSE SWELL, SMOOTH SHAVES I GET WITH A GILLETTE BLADE IN THE GILLETTE RAZOR —THEY'RE THE "TOPS"
SPOKEN WISELY! HE KNOWS WE WERE MADE FOR EACH OTHER
GILLETTE RAZOR
GILLETTE BLADE

Every Shave Is Cleaner, Smoother

when blade and razor match

● The Gillette Blade and Gillette Razor were made for each other. Both were designed *as a unit* by the same engineers. No wonder they shave you so comfortably. Buy a package of Gillette Blades. Slip one into your Gillette Razor and enjoy a new thrill in shaving!

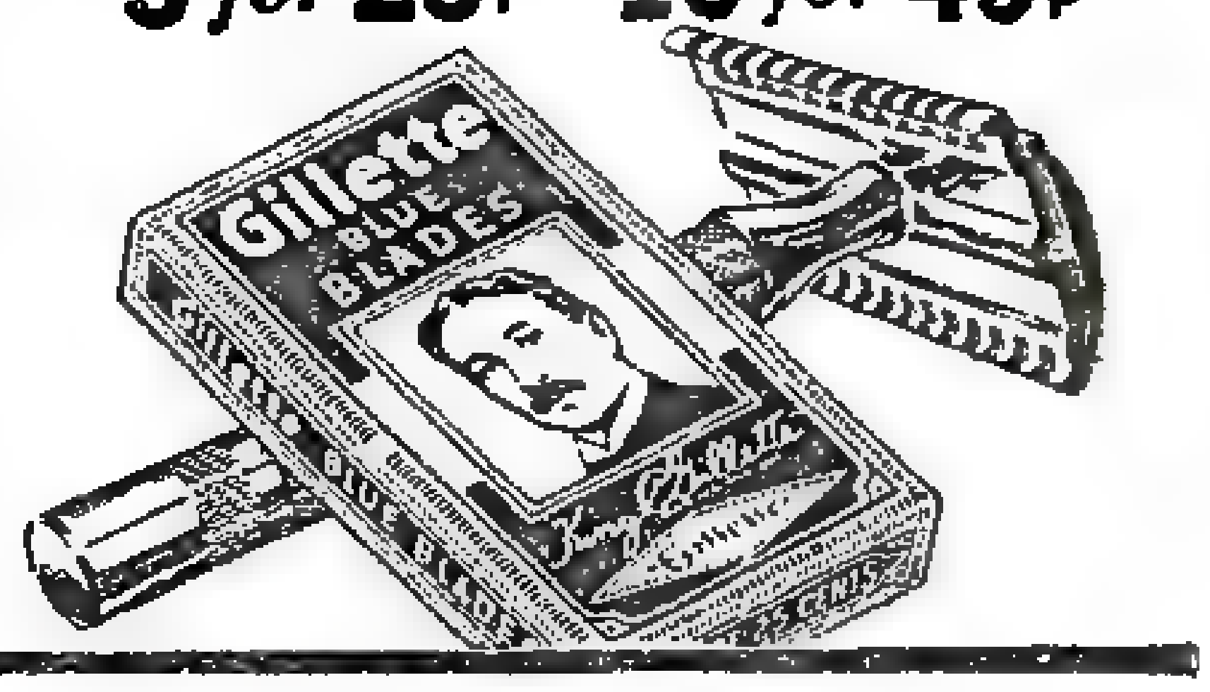
Reputable merchants never offer substitutes for Gillette Blades. Always ask for them by name.

Gillette Blades

Precision-made for the Gillette Razor

Tune in on Gillette's "Original Community Sing" program every Sunday night at 10 P.M. E.S.T.—CBS Network—Coast to Coast

5 *for* **25¢** **10** *for* **49¢**



SHOPPING GUIDE TO FAVORITE GIFTS

For A Man or Boy

DRIVER D925 DRILL PRESS

$37.50 as shown, less motor incl. belt and motor pulley

A fine drill press is one of the ideal "first tools" for any home workshop. This Driver model is sturdy enough for heavy work, yet made with precision that fits it for the most accurate drilling. SKF ball bearings, Jacobs Key Chuck. True running, vibrationless. A high quality engineered tool in every respect.

CHOOSE SAFELY FROM THE DRIVER LINE!

An 8"x30½" Lathe for $16.95.
A 14" Jig Saw for $12.25.
A 7" Bench Saw for $11.25.
A 10" Band Saw for $19.95.
A 4" Planer (Jointer) for $13.50.

Other Models Available at Slightly Higher Prices
All Engineered—All Rugged—All Easy to Operate

WALKER-TURNER CO., Inc.
517 South Ave., Plainfield, N. J.

Send me your colorful descriptive folder on 1937 Driver Engineered Power Tools.

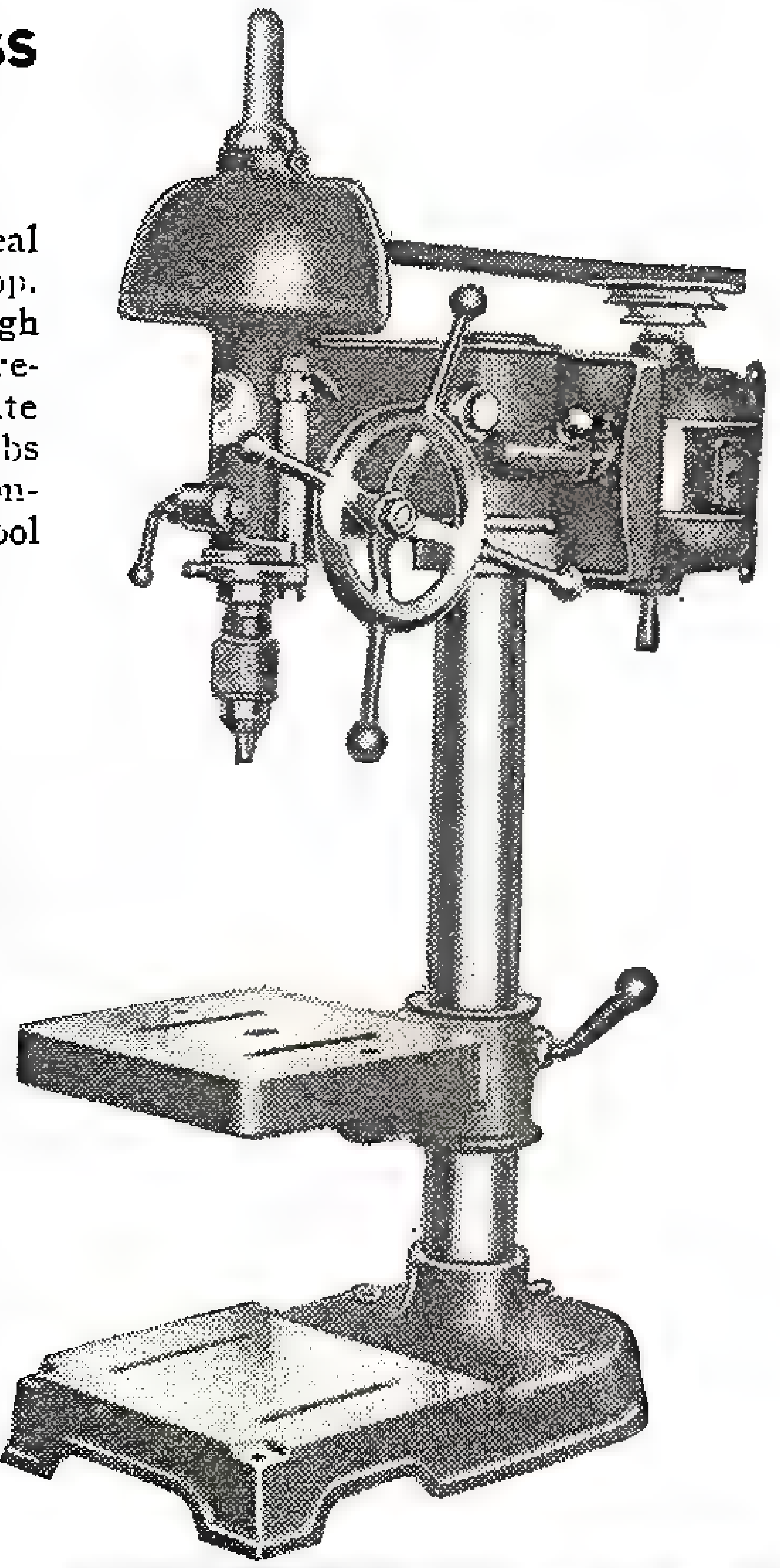
Name ______________________________

Address ____________________________

____

ASK YOUR DEALER ABOUT THE EASY PAYMENT PLAN

DRIVER *Engineered* POWER TOOLS



2400 Degrees F!!

BRONZE FOUNDRY

for School and Home Workshops

Complete Foundry Outfits are available in three sizes and make it possible for you to produce beautiful bronze, silver or aluminum castings in your home workshop. Presents such as book ends, ash trays, dishes, paper weights, letter openers, bottle openers, statuary, etc., can be quickly made by the sand casting process. Existing objects can be used as patterns, and sand moulds made in a few minutes' time. Previous experience unnecessary. Domestic gas supply and 110 volt 60 cycle energy required for operation.

Size	Crucible Capacity	Shipping Wt.	Wt. Casting	Price Complete
351	6 cu. in.	25 lbs.	1½ lbs.	$ 9.50
352	12 cu. in.	40 lbs.	3 lbs.	15.00
353	24 cu. in.	65 lbs.	6 lbs.	23.50

For 110 volt D. C. or 25 cycles energy add $4.00. Prices f. o. b. K. C. plus 1% Missouri sales tax. Check or money order acceptable, express charges C. O. D. Write for circular.

KANSAS CITY SPECIALTIES CO.
P. O. Box 6022 **Kansas City, Mo.**

ELECTROPLATING MADE SIMPLE

Amazingly new simple GUARANTEED way to PERMANENTLY electroplate Nickel, Copper, Zinc or Cadmium with a brush—As easy to apply as a coat of paint.

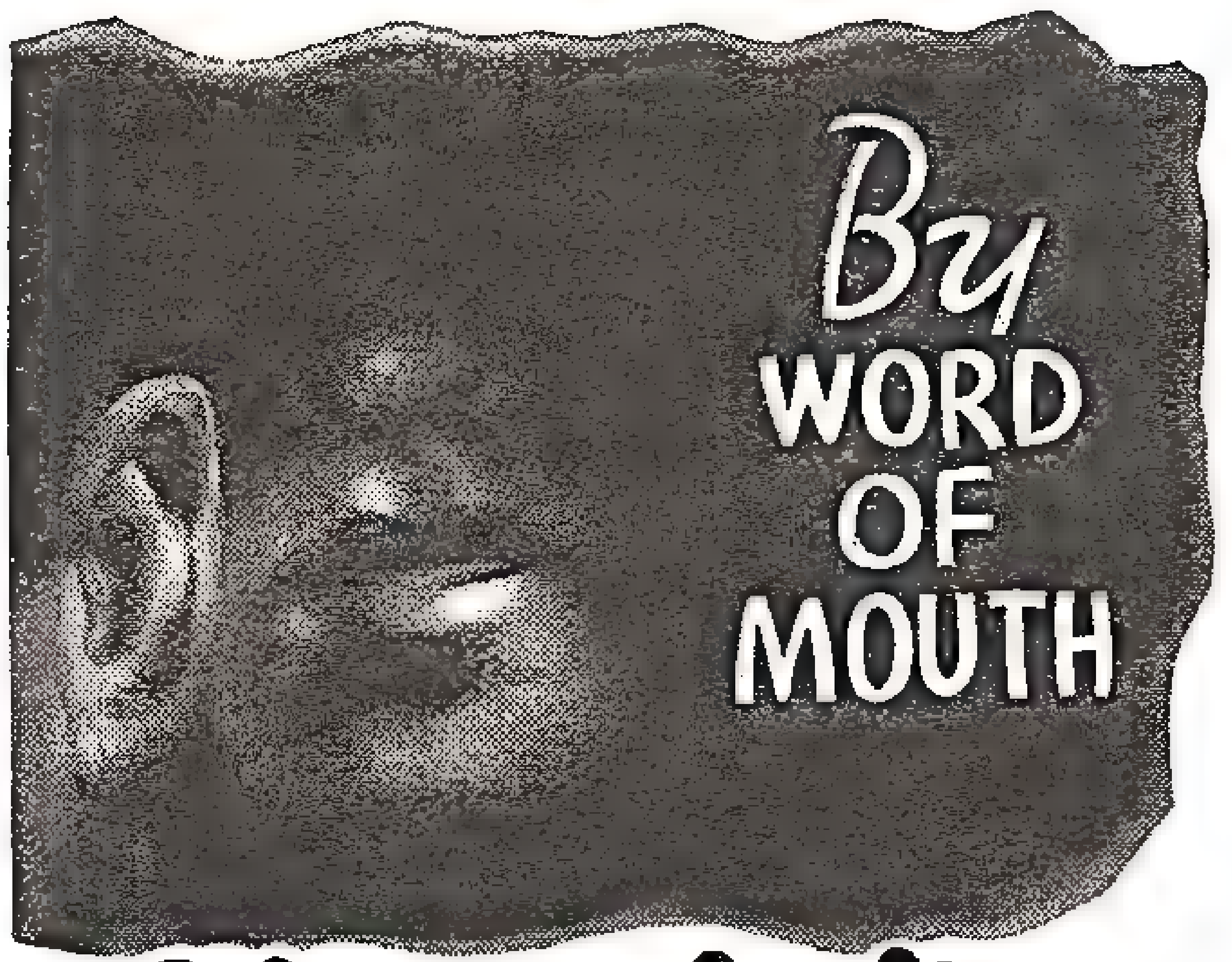
A non-liquid process, always ready for use, quickly applied, and equal to any commercial electroplating. Used in factories, homes, home work shops, garages, stores, art studios, etc.

The complete plating outfit can be carried in a pocket or tool box and operates from dry cells, automobile battery, or battery charger.

Complete outfit (less battery) $2.00. Money back guarantee. Specify metal wanted when ordering, or write for further information.

(Patented in U. S.—Canadian patents pending)

RAPID ELECTROPLATING PROCESS
2135 N. Cicero Ave., Dept. 212, Chicago, Ill.



A Message No Man Dared to Write!

Furtive glances. Whispered words. Concealed remarks. Who ever would have been so foolhardy as to commit them to writing would have signed his own death warrant. What were these communications which for generations could only be transmitted from mouth to ear? It was the rare wisdom of the ancients; age-old truths which tyrants and selfish rulers sought to suppress, knowledge which they knew would give man power, independence, *mastery of life* and the ability to attain his highest ideals. *Today,* these secret principles, once withheld from the masses, are available to the sincere, *to you* if you seek the fullness of life.

SEND FOR FREE BOOK

The Rosicrucians have for centuries, in distant lands, preserved this knowledge, kept it in secret archives. They have always made it available to men and women who sought progress in life by making the utmost of their natural talents and abilities. *They offer you* a free copy of "The Secret Heritage," which explains how you may receive these startling facts. Address:

Scribe H. F. F.
The ROSICRUCIANS
[AMORC]
San Jose California
(Not a religious organization)

PRINT-O-PRESS
TYPELESS PRINTER

ONLY
$7.95
GUARANTEED
ROTARY
LETTERS
CIRCULARS
BULLETINS
CHURCH PROGRAMS
ADVERTISEMENTS
INK
Write for Free Samples of work.

Professional Model. Does The Work of Equipment Costing Up to $200—Only $7.95

Amazing new fast Rotary Universal Printer. Prints letters, advertising, etc. for stores, offices, factories, churches, restaurants, home work. Factory-precision-built; has advanced features; does color work; portable. Simple—anyone can use it. Opens four big profit sources. Order direct. Rush $7.95 for yours complete. Guaranteed.

DETAILS SENT FREE

THE PROFESSIONAL PRODUCTS CORP.
Dept. 115
Silverton, Ohio

Spinning Metal Projects

[*Continued from page* 112]

Another excellent wood-and-metal combination is a rather deep turned dish with a lining of lead which comes up over the edge and is locked just under the lip. It is ideal for flower bulbs which can be planted in wet gravel or sand and no moisture will thus reach the wood.

First turn the bowl to shape and finish the edges with sandpaper, filler and clear lacquer. Cut the lead sheet of sufficient size. Put a small wood block securely centered in the tail stock and apply a little pressure to keep it from working out of place. A drop of glue will lock the block and lead together. Turn the lead over the edge and lock it before molding the inside to shape with the dowel and candle.

Another type of metal-wood ash tray is so attractive that it is well worth mention. It employs spinning the sheet lead as has been described and also using narrow inlays. These narrow strips of cold metal contrast nicely with the rich tones of walnut and when tooled flush with the wood surface and finished as one piece make an excellent project, appropriate for the living room or richly appointed office.

Tiny Hand Power Grinders

[*Continued from page* 99]

of which are available. The smaller cutters have, for the most part, finer teeth and with them you can do much more delicate work than you can with the larger, rougher cutter.

After the carving has been completed figure may be colored by using india ink, water colors or lacquer. Use any color scheme that you feel suits the project. Cartoon characters in the newspapers are perfect sources of subjects for the amateur craftsmen. The figures are usually simple and can be duplicated so they are easily recognized without a great amount of skill.

After the craftsman has done the more simple forms of carving he should be familiar enough with the peculiarities of the various work so he may undertake something of a new, ambitious nature such as the ship lamp which was carved from a solid piece of walnut using a high speed hand tool and steel cutters. You will notice the figure in the photo is being detailed with an exceptionally small steel cutter; the type commonly known as a finishing bur.

In model-making, too, the hand grinder can be used to great advantage in sanding down balsa model ship and airplane parts. The accessory used for this is known as a drum sander with an abrasive band mounted upon the drum sander. These bands are available in a wide variety of sizes and grits suitable for practically all classes of model work. They have the advantage of removing considerable amount of material in a relatively short time and leaving an excellent smooth surface without need of further work.

Women Head Winners' List

[*Continued from page 62*]

used, won third prize of $5 for Elvin M. Weidman, of East Petersburg, Pa. Women who have experienced the annoyance of having ordinary clothespins work loose when wind tugs at the washline will appreciate Mr. Weidman's suggestion.

To make horseback riding more comfortable, especially for novice horsemen, George Morris, Box 59, Elizabeth, Pa., suggests a saddle that can be inflated by a hand pump. A prize of $2 was sent to Mr. Morris for his idea.

Edmund Rice, of 80 Peck St., No. Attleboro, Mass., was awarded a $2 prize for his suggestion of triangular rubber strips for window framing. Rubber frames would prevent breakage from slamming and vibration. At the same time, they would be watertight.

Miss Lorraine Bradley, of 2905—18th St., Superior, Wisc., submitted an idea for a detachable baby carriage seat that won a $2 prize. The seat would enable a mother to provide transportation for both a baby in the carriage and for a toddling youngster on the seat which would be attached between the carriage handlebars.

Prizes of $1 each were awarded to the following readers for their suggestions: David Suimont, Biwabik, Minn., Charles P. Cessna, 234 Market St., Johnstown, Pa.; Ray Preski, 861 Nebraska Ave., Toledo, Ohio, and Jerry Ball, 2405 Cranshaw Blvd., Los Angeles, Calif.

If you have any good ideas for needed inventions, send them to the Needed Inventions Contest Editor. If they are practical and have not already been patented by someone, you may win one of the ten cash prizes that are awarded by the contest judges each month. Here are the contest rules:

1. In 100 words or less explain your idea for a needed invention. 2. This contest is open to everyone except employees of Modern Mechanix Publishing Co. 3. You don't have to buy a copy of the magazine or be a subscriber to enter. 4. Write your name and address plainly on your entry. No entries will be returned. 5. The editors of this magazine will be the judges. All decisions will be final. 6. Mail your entry to Inventions Contest Editor, Modern Mechanix Publishing Co., Greenwich, Conn. Entries arriving too late for next month's contest will be considered for the following month.

Newest Auto Race Track

[*Continued from page 65*]

rail. At the most dangerous curves, low concrete walls supplement the rails.

A photo-electric cell master clock at the timer's booth and 28 separate clocks, with two men at each clock, insure utmost precision in timing the competing cars. A series of powerful 20,000-watt amplifiers carry news of the race from the announcer's booth atop a 145-foot observation tower.

Racing cars are submitted to an exhaustive test before the race starts to eliminate possible accidents due to defective brakes, ignition, carburetion, etc. The administration building houses equipment for making these tests.

Attention

MEN WHO WANT TO GET MARRIED!

Most likely your income has been reduced. And yet—

You and that girl of your dreams have the precious hope of facing life together!

The obstacle is money—more money.

Listen: Thousands of men, even in these times—men who faced the same problem that now troubles you—have learned the *secret.* They're making themselves more valuable on their present jobs, preparing themselves for the bigger opportunities ahead!

They're doing it by devoting a portion of their spare time to study—by mastering International Correspondence Schools Courses that are modern and practical in their training. Many of today's business leaders started this very way.

You can do the same thing—and realize *that* hope you hold so dear. It takes work and sacrifice—what worth-while thing doesn't? The coupon will bring you good news—mail it today!

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 2321-K, Scranton, Penna.

Without obligation, please send full particulars about the subject before which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect
☐ Architectural Draftsman
☐ Building Estimating
☐ Contractor and Builder
☐ Structural Draftsman
☐ Structural Engineer
☐ Electrical Engineer
☐ Electric Lighting
☐ Welding, Electric and Gas
☐ Reading Shop Blueprints
☐ Telegraph Engineer
☐ Telephone Work ☐ Radio
☐ Mechanical Engineer
☐ Mechanical Draftsman
☐ Machinist ☐ Toolmaker
☐ Patternmaker
☐ Foundry Practice
☐ Sheet Metal Worker
☐ Boilermaker
☐ Heat Treatment of Metals
☐ Management of Inventions
☐ Diesel Engines
☐ Aviation Eng. ☐ Auto Mechanic
☐ Plumbing ☐ Heating
☐ Air Conditioning ☐ Refrigeration
☐ Steam Engineer
☐ Steam Electric Engineer
☐ Marine Engineer
☐ Civil Engineer ☐ Highway Engineer
☐ Bridge Engineer
☐ Bridge and Building Foreman
☐ Surveying and Mapping
☐ R. R. Locomotives ☐ Air Brakes
☐ R. R. Section Foreman
☐ R. R. Signalmen
☐ Chemistry ☐ Pharmacy
☐ Coal Mining
☐ Navigation
☐ Cotton Manufacturing
☐ Woolen Manufacturing
☐ Agriculture ☐ Fruit Growing
☐ Poultry Farming

BUSINESS TRAINING COURSES

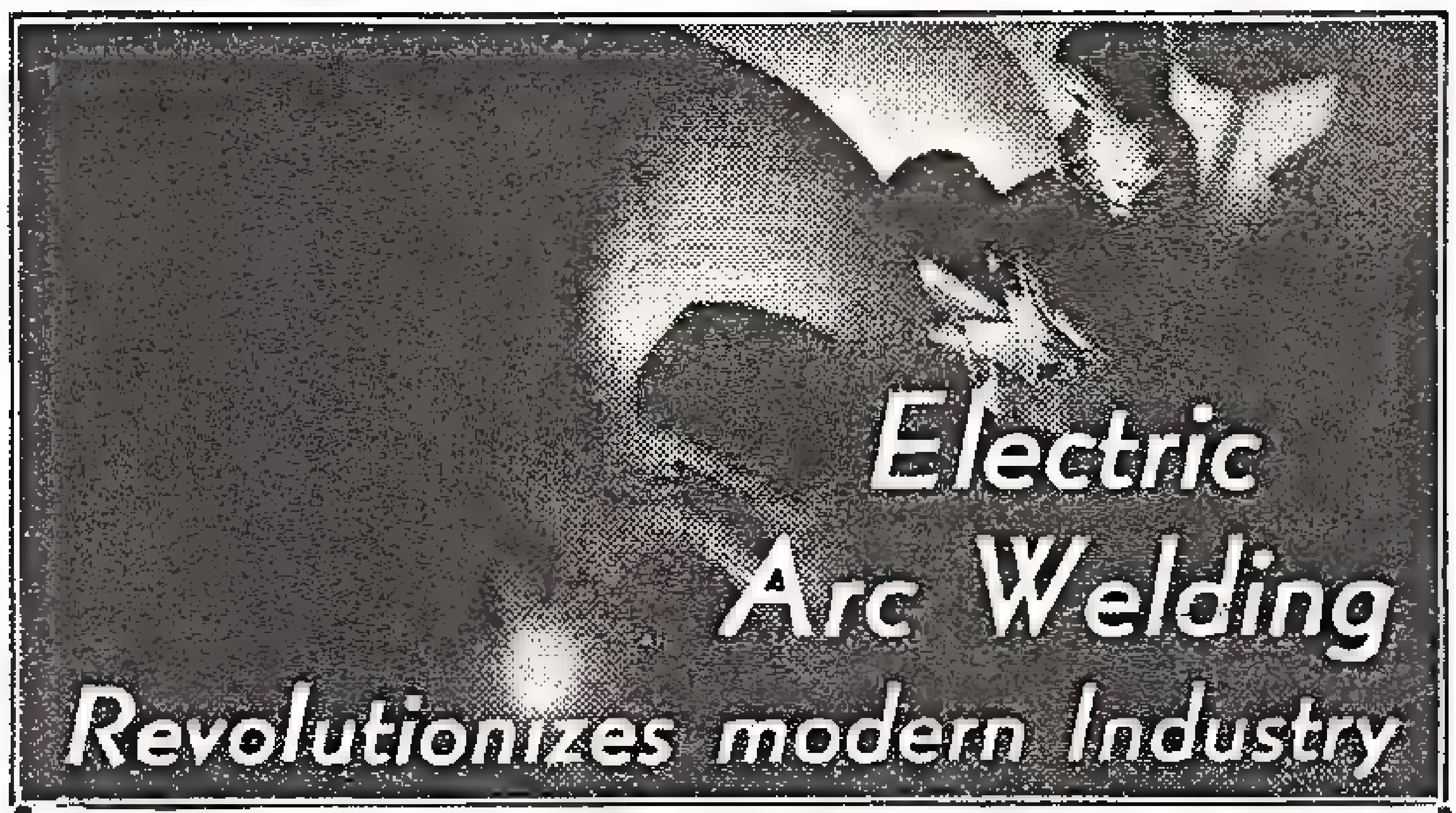
☐ Business Management
☐ Industrial Management
☐ Traffic Management
☐ C.P.Accountancy
☐ Bookkeeping
☐ Secretarial Work
☐ Cost Accountant
☐ Salesmanship ☐ Advertising
☐ Service Station Salesmanship
☐ Business Correspondence
☐ Lettering Show Cards ☐ Signs
☐ Stenography and Typing
☐ Civil Service ☐ Mail Carrier
☐ Railway Mail Clerk
☐ Grade School Subjects
☐ High School Subjects
☐ College Preparatory
☐ First Year College Subjects
☐ Illustrating ☐ Spanish
☐ Cartooning ☐ French

DOMESTIC SCIENCE COURSES

☐ Professional Dressmaking and Designing
☐ Home Dressmaking
☐ Advanced Dressmaking
☐ Millinery
☐ Foods and Cookery
☐ Tea Room and Cafeteria Management, Catering

Name..*Age*..................
Address..
City..*State*..................
Present Position...

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada



U. S. Manufacturers desire men to learn Electric Arc Welding and get practical experience under actual production conditions in the laboratories of the School of Engineering. Moderate training Fee. Accepted applicants will be fully trained until ready to pass rigid test and assisted in securing employment.

Arc Welding Engineering presents one of the outstanding opportunities for steady income and future success. Welding is growing rapidly, replacing large and intricate castings, rivets, nuts, bolts, screws. It is commonly used in assembling cranes, hoists, bridges, structural steel work, etc. No limit to the application of welding to industry, increasing durability and reducing manufacturing costs. There is a decided shortage of properly trained Welding Operators, Technicians and Welding Engineers. Why be content with ordinary work, hit and miss jobs and low pay when in a short time you can become a trained Specialist in Welding?

MILWAUKEE
SCHOOL of ENGINEERING
Institute of Electrotechnics
MM-137, Broadway and E. State, Milwaukee, Wis.

Without obligation send Free Booklet **"The Dawn of a Gigantic Industry and its Outstanding Opportunities."**
Also tell me how to become a

Welding Operator (3 mo.)____
Welding Technician (6 mo.)__
Welding Engineer (1 yr.)_____
Electrical Engineer
B. S. Degree (4 yrs.)________
Student Loan Plan__________
Refrigeration and Air Conditioning Technician (3 mo.)_____
Radio and Television Service Man (6 mo.)__________
Commercial Radio Engineer (1 yr.)
Earn Part Expense Plan_______

Name ___________________________________Age ______

City _____________________________State ______________

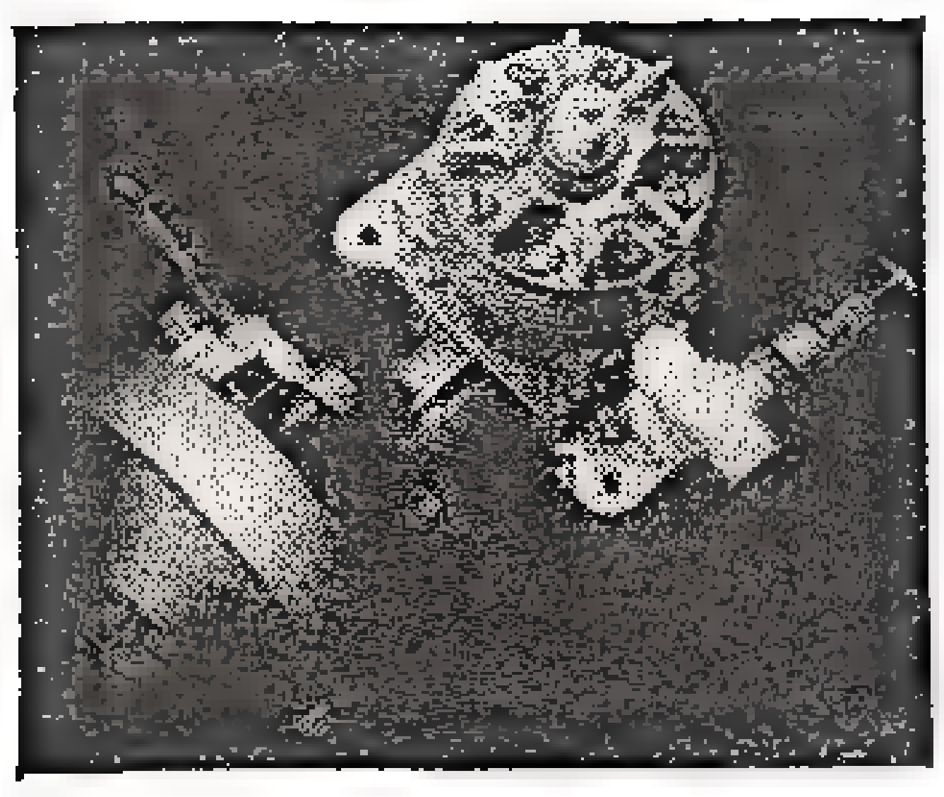
SPORTSMEN'S MANUAL
Packed with articles that make hunting, fishing, and camping trips more enjoyable and successful.
MODERN MECHANIX PUBLISHING CO.
Fawcett Bldg. Greenwich, Conn.

GAS MOTORS
Ready-to-Run

$12.50

The thrill of a lifetime is yours this Xmas with a G. H. Q. super-power gas engine—actually one of the most powerful motors ever constructed! Never in the history of gas engines was a motor ever offered at so low a price. All America has acclaimed this engineering triumph—accomplished by outstanding G. H. Q. designers and engineers after years of exhaustive, scientific, aerodynamic research. Has broken records for amazing performance. Flies model planes up to 10 ft. wing spread. Also used for boats. And look at all these extra features! Easy starting—just a twist of the wrist. Steady running—runs 27 minutes on ounce of gas. Precision, replaceable parts. Cylinder and Piston Lapped. Longest crank shaft ever made on miniature motor. Chrome nickel steel shaft with 1⅛″ bearing surface. Connecting rod of high speed bronze. ⅕ horse power at 3000 to 7000 R.P.M.

This famous motor complete, entirely assembled on a stand. Tested and run before shipment—performance guaranteed. No oil, gas or batteries included. Only $12.50. **FREE**—one finished fly-wheel mounted on motor. (This offer not for dealers). Send 3c for illustrated catalogue including information on gas accessories.



G. H. Q. MODEL AIRPLANE CO.
854-A East 149th St. New York, N. Y.

"Jumping Jeff"—Tots' Toy

[*Continued from page* 97]

and cut out the spokes. Saw out of ½″ stock two circles and bevel the edge to clamp around the rim of the tire. This may be quickly done on the lathe. Now screw these discs together on either side of the rim and a disc wheel results. Drill through the center of these pieces with a ⅝″ drill, drive into this hole a piece of ⅜″ pipe and assemble the wheel.

The mechanism which moves the head is simple to make with all details shown in the picture diagrams.

When finished and adjusted to work smoothly paint the toy in brilliant pleasing enamels. The toy makes a Christmas gift that will provide the smaller child with hours of healthful outdoor fun.

Completing The Mayflower

[*Continued from page* 107]

about 2¼ inches from the end of the bowsprit. The top-mast stay goes up between the cross trees, around the mast with an eye and down to the fore mast head with its lower deadeye directly under the cap. In the lower end of the fore top mast stay, there is a block, another block about one inch from the end of the bowsprit and the light hauling rope is seized to the end of the bowsprit and reeves through these down to the belaying pin on the foreward forecastle pin rail. The mizzen stay goes with an eye around the mast directly above the cross trees with a lanyard at its lower end fastened with a loop under the wedge cleat at the foot of the main mast.

Now prepare the yards and parrels in readiness for hoisting and rigging the sails. The first thing to do is to cut and sew the sails. Cut them large enough to allow for the hem all around. Sew into the hem, medium cord, and be careful to form little loops at each corner. For material for the sails use balloon cloth which can be purchased from ship model supply houses or use a linen that has a canvas texture. Before you cut it, however, sew vertical rows of stitching ½ inch apart, taking pains to get them parallel. The edges of the sails are curved. The main and foresail carry bonnets or small foot sails. These are fastened to the larger sails with a marline hitch. With a little study on the sail plan, you will note that the fore and main sail are rigged very similar. Start rigging the main by lashing two medium sized blocks (3/16″) about ¾″ on each side of the center line of the main yard. One inch further out from these, lash smaller blocks (1/18″) which will sheave the clewline.

Now make brace pendants of medium cord 2″ long with a large block in one end and an eye in the other. This eye goes over the end of the yard. Lash together a small and medium block and secure them at the top position at each yard-arm. The medium block runs the top sail sheet and the small block, the main yard lift. Secure small blocks under the crosstrees for running the lift-cords. When this is done, reeve a two foot length of medium cord through the single hole in the tye block, bring the two ends of the cord up through the holes in the cheeks and hitch the ends to the center of the yard so that the tye block will hang almost an inch above the top of the knight-head when the main yard is raised and draw a lanyard through these in the following manner: Secure a piece of fine cord to the staple at the foot of the knight, bring it through the first hole in the tye block then through the corresponding hole in the knight and so on until the lanyard is reeved. Belay the free end to the knight head around the lanyard.

You will now need a parrel to retain the yard to the mast. Construct this from three 1/16″ strips of wood drilled with three holes each.

Use light cord for the lifts. Secure this cord under the crosstrees, draw the ends through the small block at the yard arm, back up through the block under the crosstrees, then to the deck and belay to the cleat marked B aft of the deck guns. The main braces start at the taffrail and reeve through the pendant block, then back to the block lashed to the taffrail and belays to cleat C on the poop deck. Now for the sheet line—pass a short stick (toggle) through the loops at the lower corners of the sail and lash a large block to it for the sheet and above this a small block for the clew garnet leads. Start the sheet of medium cord at the ringbolt on the third wale, pass it through the large block just mentioned, back to the block forward of the ringbolt, then through the hole in the bulwarks just aft of the main shrouds, and belay to one of the large cleats D just aft of the two-sacker guns on the main deck. The tacks are the next in line. Use a single rope of medium cord. They are secured to the toggle stick and reeve through a hole in the chesstrees, then through a hole in the bulwarks, and belay back to cleat H inside the main bulwarks.

The bowlines are crowsfoot at the leaches, rigged with bull's-eyes and go directly forward to cleat E on the forecastle deck. Clewlines of L cord start at the quarter at the yard next to the clewline blocks on the yard, go down to the small clew blocks at the lower corners of the sail, up through the blocks at the quarter yard and belay down to cleat F at the foot of the mast. Use light cord for the buntlines which are tied to the foot of the sail and go up on the lee (forward) side and reeve through blocks at the cheeks and belay to U bolts or cleat at G near the foot of the mast.

In making the flag, it can be painted upon white silk with textile or oil colors. If using oil colors, be sure to use just the right consistency to keep the color from running. On the fore topmast, there is the flag of St. George's cross. On the main topmast we have the red cross of St. George superimposed on the white cross of Saint Andrew on a dark blue field.

With the installation of the flag the Mayflower model is completed. Placed in the neat plywood cradle, it makes a beautiful home decoration.

Amazingly Easy Way to get into ELECTRICITY

Learn to Earn More Money Every Week —or Go Into Your Own Business

Whether your age is 16 or 40. **Let us train you to prepare for positions that lead to good salaries in Electricity** — NOT by correspondence, but by an amazing modern method **right here in the great Coyne Shops** that gives you a practical Training in 90 days! Getting into Electricity is easier than you imagine if you choose the right method. **You don't need previous experience or need a lot of book learning. Start any time after you have enrolled.**

Easy Payment Plan

Mail the coupon below and I'll send you all details of my monthly tuition plan. Under this plan you can get your training first and then pay for your tuition later in small monthly payments extending over an 18-month period, **starting 5 months after you start school.**

LEARN BY DOING—IN 90 DAYS IN THE GREAT COYNE SHOPS

I don't care if you don't know an armature from an air brake — I don't expect you to! We give you 12 weeks of practical Shop work in the Big Coyne Shops. . . . Practical work on real Electrical equipment.

MANY EARN WHILE LEARNING

If you need part time work to help pay your expenses we may be able to help you if you will write and tell us your problems. **When you graduate you can get lifetime employment service.**

DIESEL, REFRIGERATION AND AIR CONDITIONING

Right now we are including instruction in **Diesel Engines, Electric Refrigeration** and **Air Conditioning** without extra cost so your training will be more valuable to you.

GET MY BIG FREE BOOK! Coyne is your great chance to get into Electricity. This school is 37 years old—Coyne training is reliable. You can find out everything absolutely free. Simply mail the coupon and let us send you the big, free Coyne book with photographs . . . facts . . . opportunities. Tells you how many earn expenses while training and how we assist our graduates in the field. No obligation to you. So act at once. Just mail coupon.

H. C. Lewis

COYNE ELECTRICAL SCHOOL
500 S. PAULINA ST., Dept. 17-53, CHICAGO, ILL.

SEND NOW FOR FULL DETAILS!

H. C. LEWIS, President, COYNE ELECTRICAL SCHOOL
500 S. Paulina St., Dept. 17-53, Chicago, Ill.
Dear Mr. Lewis: Without obligation send me your big, free catalog with facts about Coyne Training and details of your **Monthly Tuition Payment Plan.**

Name..

Address..

City.............................*State*...............

Mail in envelope or paste on a postcard

$200 My First Week

...Now in my OWN Business.

L. A. Eagles took in $200 his first week. Harry Hill says: "Paid for home with Rug-Washer. Earned $86 first day." Fred Paulson says, "Made $99 in 10½ hours." Many others make $125 to $200 per week. Thousands earning quick, easy profits. Electricity does the work. Finishes rugs like new, on customer's floor. Hundreds of customers in your vicinity and nearby towns.

EASY TERMS

Inexpensive equipment. Pay part down—balance monthly. No shop necessary. Used by the United States Government and Statler Hotel System. Manufactured since 1918—every machine guaranteed.

FREE BOOK

Send today (no obligation) for booklet illustrating Rug-Washer and telling how you can earn large profits at prices below other methods; how you can build a permanent year-around business; and how you can pay on easy terms. Enjoy a larger income. Write today—NOW.

VON SCHRADER MFG. CO.
201 Pl., Racine, Wis.

Own a CHEEZE-KIST Popcorn Route

Big Profits Manufacturing And Selling At Wholesale

Imagine fresh, crisp popcorn coated with golden yellow liquid cheese. That's CHEEZE-KIST—the newest food sensation that is sweeping the country. We furnish outfit that makes as much as $230.40 worth of CHEEZE-KIST in a day—MOSTLY ALL PROFIT. Make it in your own home and sell your entire output at wholesale to stores, taverns, roadhouses, cigar stands, restaurants, etc. STARTLING PROFITS. Cash comes in first day. No previous experience needed.

New Low Price Opens Field For Ordinary Man

Complete manufacturing equipment furnished at price so unbelievably low that even the man of most limited means can start. Everything supplied, including formula, manufacturing and selling instructions. Operation made as simple as A-B-C. Raw material plentiful and cheap.

We Trust You

Equipment shipped on credit to honest, deserving persons. All particulars furnished FREE. Simply send name today and get all the facts.

CHEEZE-KIST COMPANY
142 High St., Springfield, Ohio

Bethlehem Opens New Plant

[*Continued from page* 86]

of rollers, that squeeze it thinner, wider and much longer, is one of the best spectacles of modern industry. Clouds of steam arise from the cooling water sprays on the rolls, electric switches click, and the long, radiant carpet of metal rushes down a path of smooth-running rollers to be coiled automatically like so much adding machine tape.

Behind this rapid metamorphosis of crude steel into sheets for automobiles, refrigerators, furniture, and a hundred other products, is precise electrical control. The modern rolling mill would be impossible without the flexibility and responsiveness of motors, thousands of them, mounted upon the machines. In a lofty central room—"pulpit" to steel men—where he may survey the whirling mill below, is the god of the machine, the operator, playing with skillful mind and fingers on the bank of switches that are masters of the wheels below.

But do not imagine the human element is entirely lacking. Automatic as the machine appears in its smooth operation, constant manual adjustment is necessary in order that the strip may flow out smoothly. And man had to make the machine.

Priest Maps Roof of World

[*Continued from page* 83]

Besides discovering the fossil glacier on his 1936 expedition, the Glacier Priest exploded the theory that dinosaurs roamed the Alaskan region in the Jurassic period. Father Hubbard located the only Taku Indian alive who had seen the giant fossil tracks in North British Columbia.

On his way to meet the Indian and find the fabled tracks, Father Hubbard and his companion, Ken Chisholm, former football star of Santa Clara University, had to leap to safety on the rocks as their heavy-laden 30-foot Allegheny metal boat was capsized in the swirling ice floes of Twin Glacier River. Receiving the priest's blessing, Chisholm swam to shore to get aid. After Father Hubbard had been on the rock several hours, Mary Joyce, famous girl dog musher, sighted him from her motorboat and rescued him.

When he finally saw the fossil tracks, he ascertained they were only bear tracks and only 200 years old. They were 17 inches long and nine inches wide.

Five years ago the Glacier Priest took the first photographs of belching Aniakchak volcano, which has the largest crater in the world. The next year the daring aviator Dorbrandt flew him over it. In 1934 he astonished the world by landing in a seaplane on a lake within the crater.

But the Glacier Priest thinks his daring deeds pale beside his discovery of free chlorine gas. He trapped and bottled some which is now in the Carnegie Physical Laboratory at Pittsburgh.

He thinks this may explain the mysteries of death of people near Mount Katmai when it erupted some years ago and produced the Valley of Ten Thousand Smokes, which the Glacier Priest explored.

Including the Glacier Priest, the exploration party consisted of five men and four dogs. Each man carried a pack of 100 pounds and each dog transported 50. Other party members were Edgar Levin, graduate student at Stanford University; George Getty, youthful Oregon geologist, Cavalier and Chisholm. The expedition was joined in Alaska by John Dimond, 16, son of one of Alaska's Delegates to Congress, who was badly burned when one of the party's fishing boats caught fire.

Other casualties of the trip included two broken ribs and some torn muscles suffered when Ed Levin tumbled headfirst into a 50-foot crevasse. And Father Hubbard himself sliced off the top of a knuckle, and blood poisoning set in.

Against these haphazards, however, the Glacier Priest thinks his successes were well worth all the dangers, privations and sufferings.

As a result of his adventurous summers in the North, Father Hubbard says he has sufficient evidence to prove that the desolate waste of the Alaskan Peninsula is the cradle of most of North America's violent windstorms.

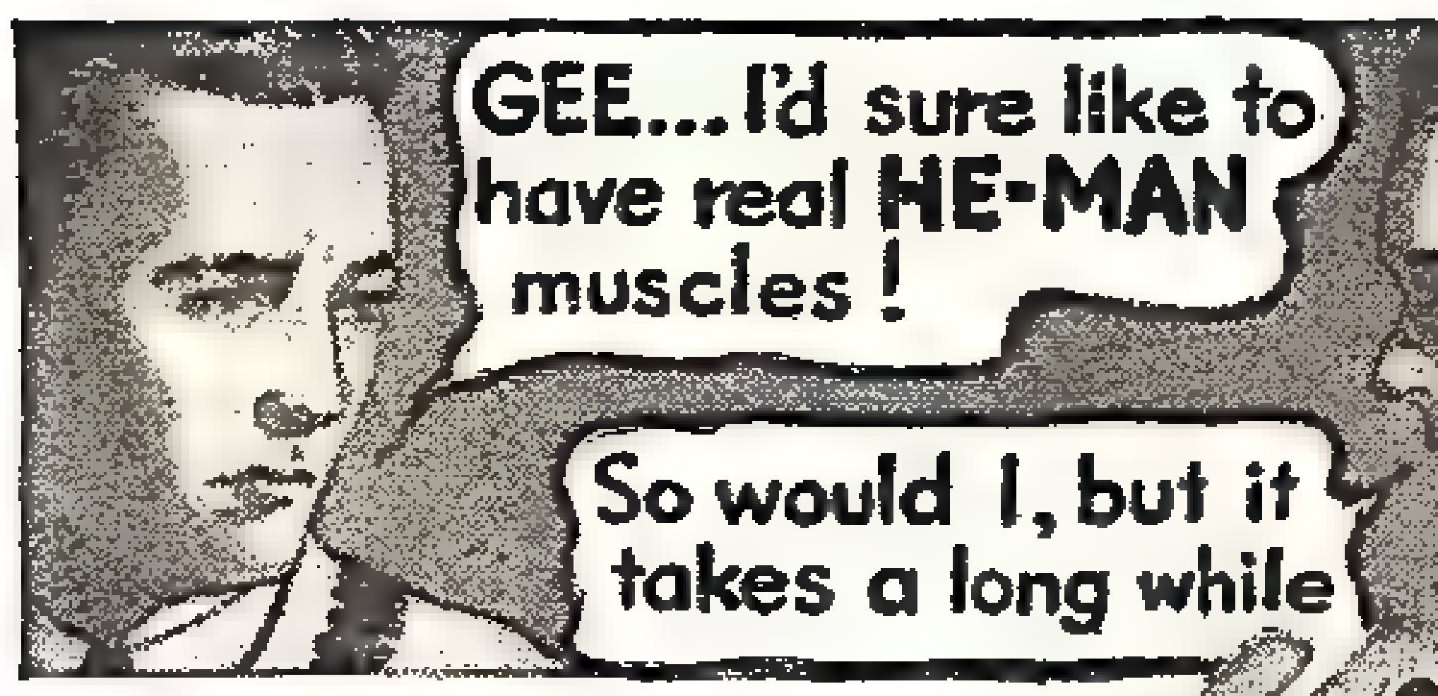
How hot is the lava that gathers on the outside of an active volcano cone? While climbing up one of the smaller volcanoes the explorers were almost blown off by a 100-mile-an-hour gale. Ironically enough, the heat of the lava beneath their feet almost burned their shoes off, while their bodies were well nigh frozen. No wonder their shoes were scorched! The Glacier Priest's thermometer told him that less than 10 inches under the surface of the volcano's swollen sides, were temperatures of over 400 degrees Centigrade.

Throughout the Aleutian Islands the explorer has been gathering evidence of a large aboriginal population, in an advanced stage of culture. He believes this island chain was one of the ancient roads by which man first came into North America, although the main route, he points out, was by the Bering Sea.

In keeping with this theory, he says, the people of Attu and Agattu Islands, the farthest eastward of the Aleutians, speak a strange language which seems to have some relationship to the speech of the hairy Ainu, the aboriginals of Northern Japan. This may constitute proof of an entirely independent invasion from Asia.

Father Hubbard also points out the existence throughout the Aleutians, of a strange sort of Rock carving which can be traced from Central Siberia, through Alaska and down the Pacific Coast to Mexico. This appears to mark the passage of some aboriginal people who had reached a fairly advanced state of culture.

The Glacier Priest now hopes within a year or so to uncover corroborative evidence of the migration of Asiatics many long years ago to North America.


GEE... I'd sure like to have real HE-MAN muscles!
So would I, but it takes a long while

—says Charles Atlas Holder of title, "World's Most Perfectly Developed Man" won in National and International contests.

"I'll Prove *in the first 7 days* YOU can have a Body like Mine!"

DON'T get the idea that it takes a lot of time and hard work for you to get smashing strength and powerful muscles! Don't think you need dumbbells, springs or other contraptions!

Both these ideas are all bunk—and I have PROVED it. All I need is 7 *days* to prove what I can do for you! And I don't need any apparatus either. In fact, I don't believe in artificial methods that may strain your vital organs for life!

NATURAL Methods Are All I Need

Here you see an actual photo of how I look today. No muscles have been "painted on." This is the camera's honest proof of what I did for MY body. Now I'm ready to prove what my secret of Dynamic Tension can do for YOURS!

A few years ago I was a physical wreck, a 97-pound weakling—flat chested, arms and legs like pipestems. I was worried I studied myself. Then I found a new way to build myself up. A way that was simple, natural, quick and sure! "Dynamic Tension" is what I called it. In a short time I had the body that has twice won the title of "The World's Most Perfectly Developed Man."

Get My FREE Book

Thousands of others now know from their own personal experience what Dynamic Tension has done for them.

This little coupon brings you my free book, which tells all about it. No cost or obligation.

I just want to give you proof that I can do for you what I have done for so many others; give you broad, powerful shoulders, biceps that bulge with smashing strength, a chest which stands out solid and muscular, and an evenly developed body that will make others look like dwarfs next to you. Mail this coupon TODAY! CHARLES ATLAS, Dept. 6N, 115 E. 23rd St., New York, N. Y.

THIS STERLING SILVER CUP BEING GIVEN AWAY

This valuable cup stands about 14 inches high on a black mahogany base.

I will award it to my pupil who makes the most improvement in his development within the next three months.

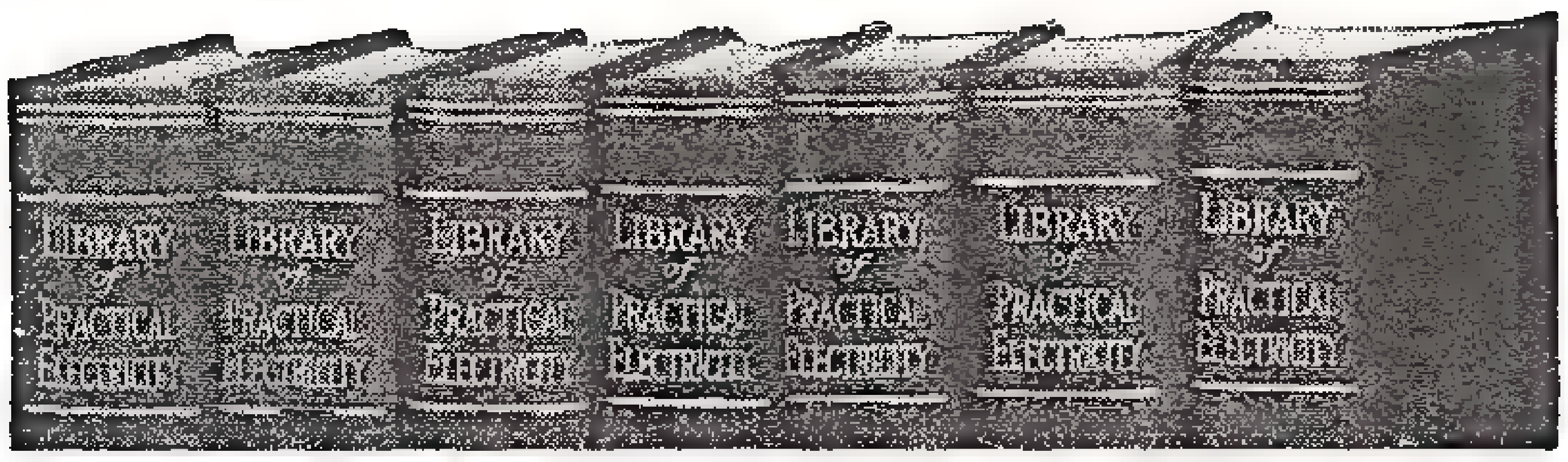
CHARLES ATLAS, Dept. 6N,
115 East 23rd Street, New York, N. Y.

I want the proof that your system of Dynamic Tension will make a New Man of me—give me a healthy, husky body and big muscle development. Send me your free book, "Everlasting Health and Strength."

Name ....
(Please print or write plainly)

Address ....

City ....State ....



FREE—if you act now—*Kushlan's*
HANDBOOK OF INDUSTRIAL ELECTRICITY

with the
Croft Library of Practical ELECTRICITY

Regular McGraw-Hill 500-page manual of practical information for those engaged in electrical construction, maintenance, testing, inspection and contracting. Yours without charge on receipt of your first payment for the Croft Library. The Croft Library is a complete electrical educator. It is founded on practice—on 20 years of shirt-sleeve experience—on work as it is actually done. It is jammed from cover to cover with the kind of hard-headed facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough that it is the daily guide of 59,000 highly paid electrical workers and engineers. Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers' circuits, switchboards, distribution systems—electrical machinery of every type—wiring for light and power—wiring of finished buildings—underwriters' and municipal requirements—illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from estimating it, to completion.

No money down—easy payments

Fill in and mail the coupon attached and we will send you the entire set of seven volumes for ten days' Free Examination. We take all the risk—you assume no obligation. If you decide to keep the books, send $1.50 in 10 days and the balance at the rate of $2.00 a month and get Kushlan's useful Handbook free, in addition. Send the coupon NOW and see the books for yourself.

FREE EXAMINATION COUPON

McGRAW-HILL BOOK CO., 330 W. 42nd St., New York

Send me for ten days' free examination the Croft Library of Practical Electricity. If satisfactory I will send you $1.50 in 10 days and $2.00 monthly until the price of $19.50 is paid. If not wanted, I will return the books postpaid. Upon receipt of my first payment of $1.50 you are to send me a copy of Kushlan's Handbook of Industrial Electricity, absolutely free.

Name --

Home Address --

City and State --------------------------------------

Position --

Name of Company--------------------------------MMx-1-37

INVENTORS *all* PATENTS ARE *NOT* GOOD PATENTS

There Are Many Degrees Of PATENT PROTECTION

You want to make money from your invention, therefore, you want the best patent you can possibly get. But a good patent depends not only on the invention itself, but upon the skill and interest of your patent attorney in drawing up the claims and specifications and in following your case to a successful conclusion. C. A. Snow and Company have had over 61 years of specialized patent experience. We know the difference between strong patents and weak ones. We won't promise you something we can't get for you.

Write today for our free document: "CERTIFICATION OF INVENTION" and our two free booklets: "HOW WE PROTECT YOU" and "SUGGESTIONS ON HOW TO COMMERCIALIZE YOUR INVENTION". Fill out the coupon below NOW.

Cut Coupon On Dotted Line

DEPT. C-13 - SNOW BUILDING, WASHINGTON, D. C.

Gentlemen: Please send me absolutely free and without obligation on my part, your original document, "Certification of Invention", together with your two guides for inventors, "How We Protect You" and "Suggestions On How To Commercialize Your Invention."

NAME________________________________

ADDRESS_____________________________

(PLEASE PRINT NAME CLEARLY)

C. A. SNOW & CO.
Registered Patent Attorneys Since 1875

Christmas Circus For Kiddies

[*Continued from page* 101]

horses can be of various markings, but each team should be matched.

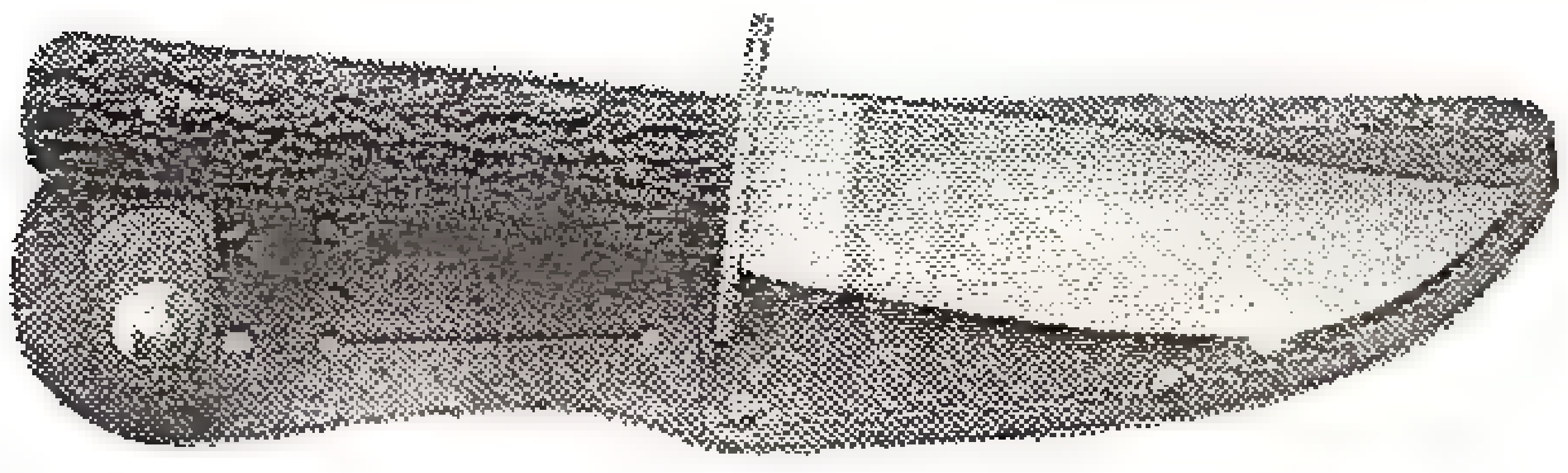
Assembly of the wagon is clearly shown. The smaller front wheels are made to turn on a screw in the manner shown. Four to eight teams can be hooked up on each wagon and any youngster will thrill to hitch up long strings of them for a parade.

A trick elephant to go with the circus can be made to assume all sorts of comical attitudes. Three-quarter-inch white pine is used for the body with a jointed trunk, and legs secured with rubber bands. The performing horse, clown, monkey as well as camel, lion and giraffe should be mounted on a wood base so that they will stand up. Paint circus toys in bright enamels.

ANSWERS TO MM MEMORY TESTERS

(Questions on page 54)

1. Rectifiers convert pulsating alternating current into direct current. The most common types of rectifiers are used in radio receiving sets.
2. Air can be weighed with any sensitive laboratory balance. A liter of air weighs about 1.293 grams.
3. A hydraulic ram is used to pump water higher than its source without the use of external power. It has one disadvantage and that is the amount of water it wastes.
4. There are two kinds of energy, Potential and Kinetic. Energy which a body has by virtue is known as Potential. Energy produced by the motion of a body is Kinetic.
5. Gold and silver, when cast, shrink upon cooling. If coins were made in this manner they would vary in size. Stamped coins are always uniform and can be made more quickly, too.
6. Sound travels comparatively slow through air. This can be demonstrated by the fact that steam issuing from the whistle of a distant locomotive is seen several seconds before the actual sound is heard. Sound transmitted by wire travels at the rate of approximately 150,000 miles per second.
7. A Centrifuge is a machine used to separate liquids having unequal densities. A cream separator might be classified as such, although the Centrifuge is a laboratory device.
8. The Wheatstone Bride is an instrument which determines the value of an unknown resistance. Breaks in long distance phone lines are located with this instrument.
9. Only iron and steel and their immediate alloys can be magnetized. All other metals are non-magnetic.
10. The air surrounding a "vacuum" cup holds it fast to the object since the air between the cup and surface has been evacuated. Actually there is no vacuum involved; the real pressure is on the outside of the cup, not the inside.
11. Copper will expand considerably more than any other common metal. In expansion aluminum is next.
12. Water or any other liquid with a similar specific gravity can be cooled to below the freezing point without solidification. The process is known as super-cooling and must be done without jarring the lquid. If shaken after being super-cooled the water will freeze instantaneously.



FREE: This Outdoors Sheath Knife

Ideal for hunting, fishing and camping trips. It has a sturdy 4" blade, tempered and polished, with keen, durable cutting edge. Blade extends clear thru the bone stag handle. Complete with leather sheath. OUTDOORS is a monthly magazine you will enjoy. Filled with illustrated stories and information on hunting, fishing, camping and outdoor activities. Also up-to-the-minute information on guns, fishing tackle, dogs.

OUTDOORS
15¢

SPECIAL OFFER

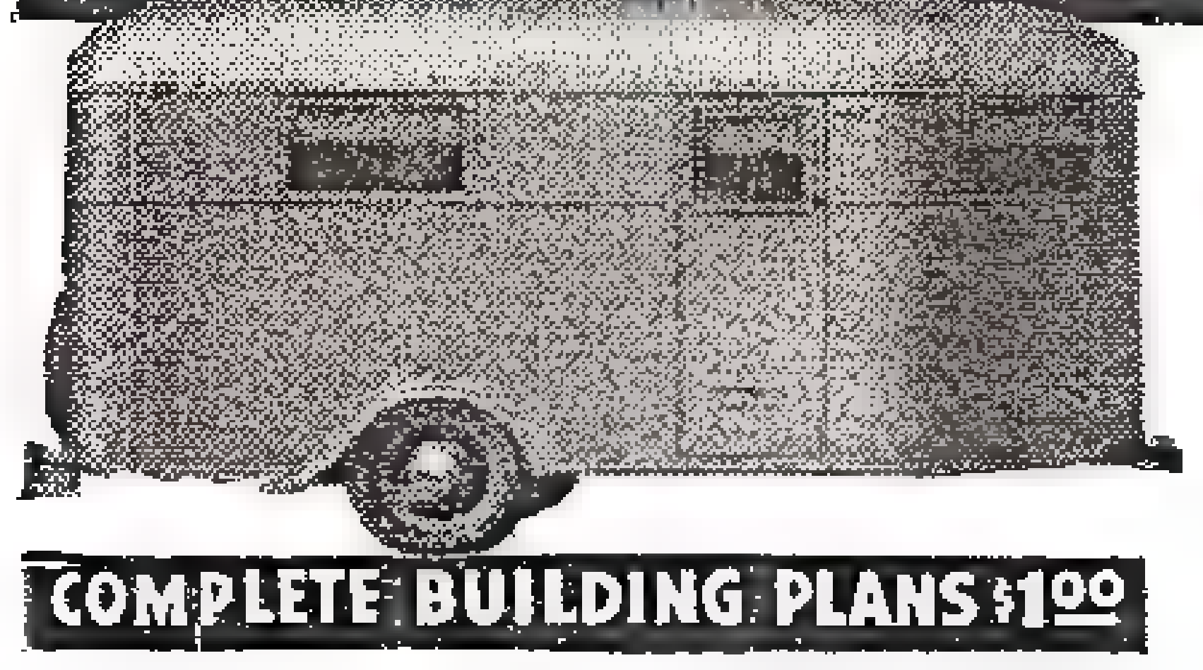
We will send you this Sheath Knife and OUTDOORS MAGAZINE for a whole year.

Both for only $1.00

Clip this ad and mail today with $1.00 bill to

OUTDOORS, Dept. M
333 N. Mich. Ave., Chicago, Ill.

BUILD IT YOURSELF PLANS $1.00



COMPLETE BUILDING PLANS $1.00

JIM DANDY CABIN CRUISER

The Trailer that has Everything

With my plans you can build this beautiful coach with ease and save money. Plans show every detail of building body, chassis, beds, cabinets, drawers, refrigerator, top, electric light and water systems and *where to buy all parts.* The Jim Dandy Cabin Cruiser can be built in any size to accommodate 2 to 4 people. Send $1.00 for these plans today—get started now!

MAIL DOLLAR BILL TO JIM DANDY, Box 125-C, Wausau, Wis.

AGENTS 500% PROFIT

GENUINE GOLD LEAF LETTERS

Guaranteed to never tarnish. Anyone can put them on stores and office windows. Enormous demand, large profits. Paul Clark says: smallest day $28.70. R. L. Reel made $920 in two months. Write today for free sample and liberal offer to general agents.

METALLIC LETTER CO., 426-A N. Clark St., Chicago

RADIO ENGINEERING

RCA Institutes offer an intensive course of high standard embracing all phases of Radio. Practical training with modern equipment at New York and Chicago schools. Also specialized courses and Home Study Courses under "No obligation" plan. Catalogue Dept. MM-37.

RCA INSTITUTES, Inc.

75 Varick St., New York. 1154 Merchandise Mart, Chicago
Recognized Standard in Radio Instruction Since 1909.

GOV'T. JOBS

SALARY TO START $90 to $175 MONTHLY

MEN.. WOMEN

Age Range 18 to 50

( ) Railway Mail Clerk
( ) P. O. Laborer
( ) R. F. D. Carrier
( ) Special Agent
( ) Customs Inspector
( ) City Mail Carrier
( ) P. O. Clerk
( ) Stock Clerk
( ) Spec. Investigator
( ) Typist
( ) POSTMASTER
( ) Elevator Conductor
( ) Auditor
( ) Stenographer
( ) U. S. Border Patrol
( ) Telephone Opr.
( ) Watchman
( ) Meat Inspector
( ) Secret Service Opr.
( ) File Clerk

INSTRUCTION SERVICE, Dept. 233, St. Louis, Mo.

Send me FREE particulars "How to Qualify for Government Positions" marked "X". Salaries, locations, opportunities, etc. ALL SENT FREE.

Name ____________________________

Address ____________________________

NOW—A Genuine 7-Inch BLACK & DECKER ELECTRIC SANDER

No. 17 JUNIOR
FOR ONLY
$39.50

THE NEW 7-INCH JUNIOR SANDER saves hours of slow, hard work with sandpaper, emery, files, etc. Makes quick work of such jobs as cleaning and smoothing wood or metal surfaces; removing paint and rust; grinding and smoothing welds and casting ridges; rubbing down new lacquer with felt rubbing pad; polishing metal, etc. Universal motor operates on A. C. or D. C. A great tool. A great value. Only $39.50.

LOW PRICED B & D DRILLS, TOO

½-INCH JUNIOR DRILL: (Illustrated). Drives twist drills for drilling up to ½" holes in steel; augers for drilling up to 1" holes in wood. Also drives Black & Decker Hole Saws for cutting clean, round holes from ¾" to 3½" diameter in any material a hacksaw will cut. Universal motor. Only $35.00.

¼-INCH JUNIOR DRILL: Drives twist drills for drilling up to ¼" holes in metal; augers for drilling up to ½" holes in wood. Also drives light wheels for grinding, buffing, polishing, etc. Universal Motor. ONLY $19.50.

MAIL THE COUPON TODAY for Black & Decker Catalog and name of nearest dealer where you can see these and other Black & Decker tools.

BLACK & DECKER

World's Largest Manufacturer of

PORTABLE ELECTRIC TOOLS

MAIL FOR FREE CATALOG

BLACK and DECKER

THE BLACK & DECKER MFG. CO.,
701 Pennsylvania Ave., Towson, Md.

Please send Free Catalog showing Junior Sander, Drills and other tools, and address of nearest B & D Dealer.

Name ____________________________

Occupation ____________________________

Address ____________________________

City ____________________ *State* ____________

AMAZING NEW ELECTRIC

ARC WELDER

COMET

RETAILS Only $1.95 Complete

HOOK UP TO ANY BATTERY!

Just invented! Amazing new Comet ELECTRIC ARC WELDER—hooks up to any storage battery—generates tremendous heat to weld all metals. PRICE, ONLY $1.95, complete. Repairs fenders, auto bodies, galvanized cans, radiators, castings, machinery parts, etc. Fuses broken parts permanently, stronger than before. Low power consumption. Take the Comet anywhere to the job, operate from auto battery. Sturdily built of finest materials to last years. FULLY GUARANTEED BY BIG MANUFACTURER.

SEND NO MONEY !

You'll find a thousand uses for the Comet around your home, garage, and work shop. Thousands of garages need the Comet Welder. Also factories, repair shops, mechanics, farmers, inventors, tin shops, plumbers, etc. Order a Comet now. Send no money. We'll rush one to you, complete with rods. Pay postman only $1.95 plus few cents postage. If not delighted, return Comet in 5 days from receipt and money you paid for it will be refunded instantly. Rush your order NOW.

COMET WELDERS, Dept, P-1. CINCINNATI, OHIO

Nationally Known RADIOS FACTORY TO YOU SAVE ½

EVEN with "trade in" allowance on old radio you CAN'T save ½ AT STORES. BUY DIRECT FROM FACTORY. Save ½ on 31 FULLY GUARANTEED Miniature, Console, Automobile models. AC-DC Superhet and Battery Sets. 2 and 3 tuning bands. 4 to 8 tubes. Automatic Volume and Tone Control. Illuminated Airplane dials. Modernistic lines. Foreign, U. S. reception.

FREE! Illustrated folder. Factory price list. JUST TIME FOR XMAS DELIVERY. SEND QUICK TODAY.

CAPITOL RADIO CO., Dept. A-1, 43 E. Ohio St., Chicago, Ill. U. S. A.

LOW COST FUN!

1937 improvements give greater horsepower, longer life, increased mileage. Send for catalog on new models. The classiest motorcycles you ever saw. Color options at no extra cost. Write today.

HARLEY-DAVIDSON MOTOR CO.
Dept. MM Milwaukee, Wis.

HARLEY-DAVIDSON Motorcycles

MAKE MONEY IN YOUR WORKSHOP

Build furniture, auto trailers, canoes, iceboats, cruisers, sailboats and electric refrigerators described in

FREE BLUEPRINT BOOKLET

MODERN MECHANIX PUBLISHING CO.
GREENWICH, CONN.

THE LIFELONG GIFT

A WOLLENSAK MICROSCOPE

425 Power Only $18.50

Give him a gift that will open the door to Nature's endless wonders. A Wollensak Microscope lasts forever, unless abused. Defines minute details clearly, sharply—the scientific test of fine quality. Magnifies 425 diameters—and only $18.50. Greatest magnification on the market at anywhere near that price. Others:—150 diameters, $12.50; 100 diameters, $5.00. At stores or direct, postpaid (or C.O.D.), under money-back guarantee. Literature free.

WOLLENSAK OPTICAL CO.
821 Hudson Ave. Rochester, N. Y.

WOLLENSAK MICROSCOPES • TELESCOPES RIFLESCOPES • BINOCULARS

Utility Amplifiers

[*Continued from page* 91]

receiver or other radio device. The two-tube DX-ER which appeared in last month's MM can be powered with this amplifier.

Since the pictorial diagrams show the exact locations of all parts and their proper connections little detail on the wiring is necessary. All resistances are of the carbon pigtail type and are rated at one watt. The fixed condensers are of the tubular type except for the two .002 mfd. units which are small mica condensers. The electrolytic condenser in the power supply consists of a 8 and 16 mfd. unit in one case with a single negative lead for both. Power transformer is a midget type with a 300 volt, center-tapped plate winding, and two filament winding; one a 6 volt and the other a 5 volt.

The dynamic speaker field winding serves as the filter choke in the power supply. The speaker is a midget dynamic type and attaches to the amplifier through a 4-prong plug. Ordinary tube sockets are used for both the speaker plug connection and the external power supply cable.

The complete amplifier can be built for less than $9.00 including tubes. It is attached to a battery operated receiver by connecting a 50,000 ohm carbon resistance across headphone terminals and connecting input of the amplifier to the B minus and plate prong of cutput tube on the receiver.

Extend Holiday Greetings

[*Continued from page* 95]

of this drive wheel, as diagrams indicate, moves in the ½" slot cut in the lever to give it a right to left motion which is transmitted to the reindeer through a stiff wire to give them a galloping motion.

Santa in the sleigh is mounted rigidly against the background by three bolts and spools. Black ribbons are glued in place to represent reins and traces. The display is driven by an electric motor located on the ground and connected with a speed reducing unit.

Another attractive decoration is a modernistic Christmas tree. This is formed of four step-like stringers mounted on a 3 foot square base. The tread cuts in these stringers are 3⅜" and the riser cuts 9 inches. These risers are beveled along the edge to a 45 degree angle to provide a flat surface to which the ⅛" pressed wood covering is secured with brads.

Construct the base of 1"x6" material, brace, and cover with ⅛" pressed wood. The truck of 1"x6" material is 8" square and 10" high, and is nailed to the base and tree. One inch holes bored in the treads and 2" holes bored in the bottom of the tree section are backed up with colored Cellophane or flood light gelatin and lighted from within the tree by means of four 50 watt and one 100 watt lights as shown. The tree and base are painted gray and the quarter and half round mold trim is painted vermilion. The tree may be covered with clear Cellophane to provide a glistening reflecting surface for the colored lights within.

Another Christmas tree in the modern manner may be constructed from an empty 20-gallon, cone topped, jacket can from which the wood covering has been removed. After cutting the sides to form six wedge shaped segments fit the spout over a wooden plug screwed to the wood base.

A ten foot two-by-four cross forms the frame for a giant star which makes a simple yet effective lawn decoration. Place the cross-arm 6 feet above the ground, and set 1" screw eyes in the three upper extremities of the cross and in two stakes driven into the ground four feet on each side of the upright. About the heavy cord laced through these screw eyes, twine a light cable in the outline of the Star of Bethlehem.

An electrically lighted, revolving wreath may be constructed from the under-carriage of a toy wagon to which

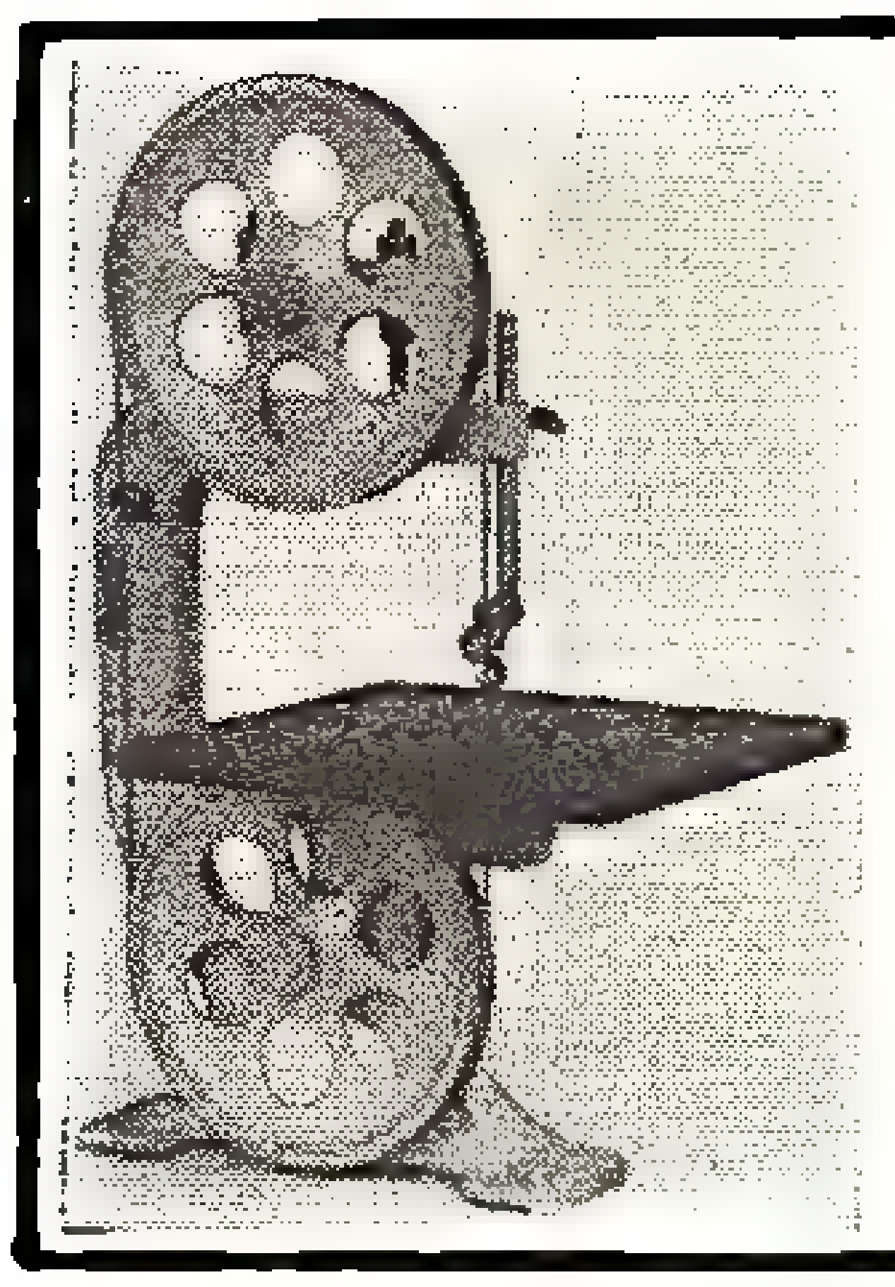
[*Continued on page* 134]

Law!

LEARN AT HOME

Are you adult, alert, ambitious, willing to study? Investigate LAW! We guide you step by step—furnish all texts, including 14-volume Law Library. Training prepared by leading law professors and given by members of bar. Degree of LL.B. conferred. Low cost, easy terms. Send NOW for Free, 64-page "Law Training for Leadership."

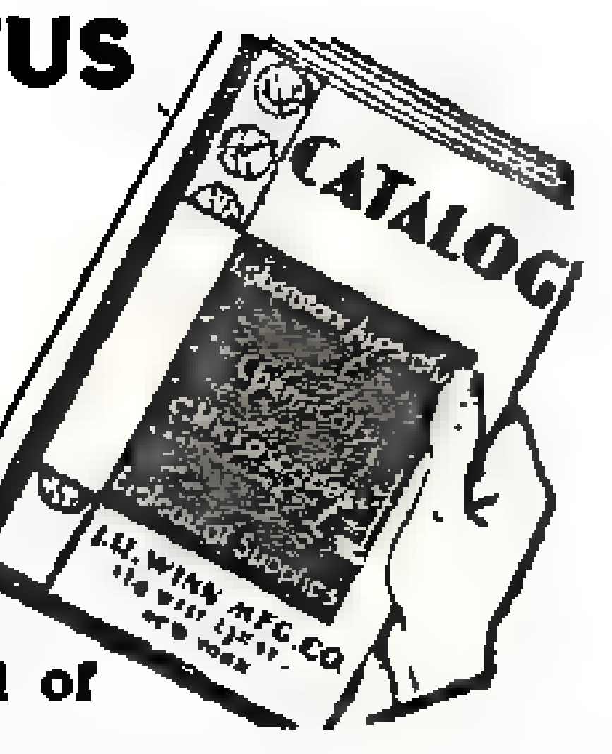
LaSalle Extension University, Dept. 1493-L, Chicago



A SHAW 8" $7.85 BAND SAW...

Shaw 8" Band Saw has all the features of the higher priced saws. One piece frame standard construction. 10"x10" tilting table. Cuts stock 3" thick, brz. bearings. Disc wheels. Steel roller guide. ¼" saw furnished with machine. Finished in 4 coats grey enamel. $15.00 value. Terms $1.00 with order, bal. c.o.d. Delivered to 3rd zone.

THE SHAW COMPANY
416 N. Tenth St., Mil., Wis.



FREE!

LABORATORY APPARATUS
BIOLOGICAL SUPPLIES
MICROSCOPES
TELESCOPES
CHEMICALS

New complete 32 page catalog lists hundreds of items of interest to amateur and professional experimenters. Save Money—Buy Direct. Send now! It's FREE and crammed full of bargains and valuable information.

J. H. WINN MFG. CO., Dept. 201, 124 W. 23d St., New York

Free TRIAL LESSON in DRAFTING

FREE TRIAL LESSON

Get ready now for new money-making opportunities in Drafting. Clean, well-paid work. Send post card for FREE TRIAL LESSON in Drafting. Shows how easy to learn at home by C.T.C. method. We furnish all tools. Write today.

CHICAGO TECHNICAL COLLEGE
A262 Tech Bldg., 118 E. 26th St., Chicago, Ill.

BE A RAILWAY TRAFFIC INSPECTOR

Write TODAY for the STORY of this WELL-PAID FIELD

ACTIVE, RELIABLE MEN—19 to 50—who complete our simple, home-study course, make good money as Railway and Bus Passenger Traffic Inspectors. We place you at up to $135 per month plus expenses, to start, or refund tuition. Steady work—advance with experience. Write for Free Booklet.

STANDARD BUSINESS TRAINING INSTITUTE
Div. 6101 Buffalo, N.Y.

DEFEND YOURSELF BY JU-DO!

Amazing, new, self-defense science. Invented by the Japanese. Now open to the public for the first time. By it, small man or women can easily overcome any attacker. Learn it! Big tough man charging at you with fists, crash him—ZIP!—to the pavement on his face. Just one quick, sly motion. Anyone threatening you with club, knife, gun—knock him senseless in a flash. No wreaths in your home; wreaths in his home. Complete, ILLUSTRATED, book of instructions, only one dollar. Filled with beautiful, half-tone engravings showing the exact way to perform each trick. You can't, you simply cannot, imagine how easy these tricks will make defending yourself. Send dollar NOW! Get this book of instructions right away! Address:—

PROF. G. MAWAISHI, Studio 12, Box 365, Mount Vernon, N.Y.

NOW FIX ANY MAKE OF AUTO

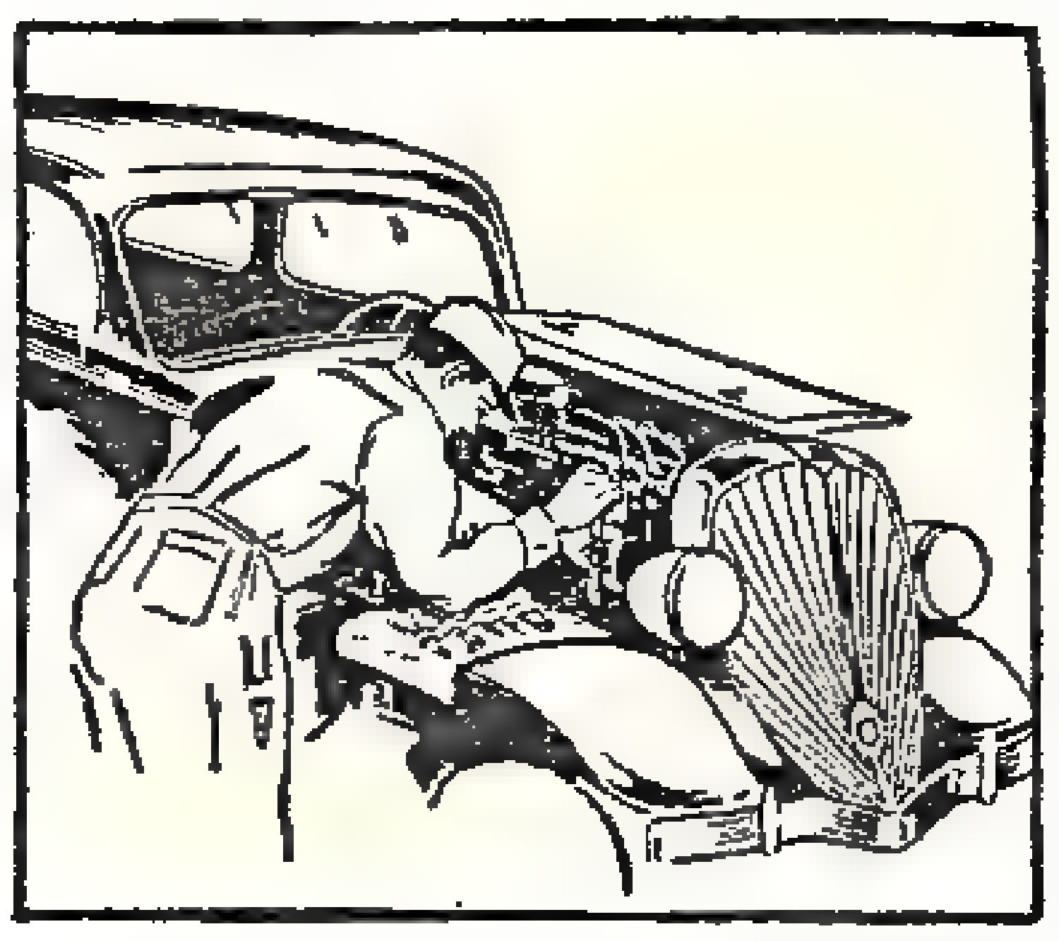
SIX BIG AUTO BOOKS ALL SHIPPED FREE

on approval; whether you want to qualify as garage owner, auto repair expert or merely wish to know how to keep your own car 100% efficient, look at these books—they are sent to you for free examination. This brand new edition has been prepared by a large group of America's greatest automotive engineers. Anybody who can read will understand them, for this great automobile encyclopedia is a veritable gold mine of valuable facts. Take advantage of this offer now; send in the coupon for FREE examination. You don't pay us a penny, you don't obligate yourself to pay anything unless you decide to keep the books. Just tell us you want to see them and the full set of 6 great volumes, just off the press, will be sent to you! Read them, look them over and prove to your own satisfaction that one fact alone, which you will find in them, may save you an expensive repair, or help you to a better job.

DIESEL ENGINES
AVIATION MOTORS
MOTORCYCLES
OUTBOARD MOTORS
MARINE ENGINES
TRACTORS
AUTOMOBILE RADIOS
ALL COVERED

Very Latest Edition

Imagine books which are so new that every page is right up to date—wiring diagrams, construction details, service problems—are all right up to the minute. Nowhere else can you get as complete and timely information. Over a million dollars of resources have enabled us to give you the most authoritative books on the subject ever published. Everybody interested in automobiles in any way will welcome these books published by the world's largest publishers of Technical Cyclopedias (est. 1897) with agencies all over the world.



Can You Fix It?

Can you take out "play" in differentials? Can you kill the "shimmy" in steering? Can you reset TIMING? Can you put your finger on engine trouble without guessing or tinkering? Can you pull the starter off and fix it? Can you adjust and repair transmission, engine, rear axle, bearings?

These Books Tell How

and tell you how to do any and every auto job right, the first time.

6 Big Volumes

Nearly 3,000 pages, over 2,000 illustrations, wiring diagrams, equipment charts, etc. De Luxe edition with gold-stamped flexible binding. Sent FREE for 10 days' use. If not wanted return express collect. If kept, send only $2.00 after 10 days, then $3.00 a month until the total price of only $24.80, is paid.

A Year's Consulting Membership FREE!

Privilege of consulting engineers of million-dollar American Technical Society for one year if you mail coupon immediately. We also include 2 extra books, "Service Shop Management" and a loose leaf book of new diagrams. **American Technical Society, Drexel Ave., at 58th St., Dept. A-1320, Chicago, Ill.**

SEND NO MONEY

American Technical Society,
Drexel Ave. at 58th St., Dept. A-1320, Chicago, Illinois

I would like to see the brand new 6-volume edition of your automobile books but without any obligation to buy. I will pay the few cents delivery charges only and will examine the books and return them at your expense in 10 days unless I like them, in which case I will send you $2.00 then and only $3.00 per month until the total price of only $24.80 is paid. You are to include free, consulting membership certificate in the American Technical Society and the two extra volumes mentioned above.

Name ....

Street ....

City ....**State** ....

Employer's Name ....

Employer's Address ....

Please give us, in addition, the name and address of one business man as reference.

INVENTORS
SEE
Pages 8 and 9

DEVELOP & PRINT YOUR OWN SNAPSHOTS
COMPLETE OUTFIT $1.95
Save One Half!
Save money developing, printing your own pictures! No experience needed. Send only $1.95 for professional outfit including electric ruby lamp, developing and fixing trays, chemical, photograph paper, complete directions. A $2.65 value. Satisfaction or money refunded. Write for FREE BARGAIN BOOK of cameras and supplies.
CENTRAL CAMERA CO., Est. 1899, 230 S. Wabash, Dept. J-1, Chicago

AUTO ENGINE SPEED CONTROL
GOVERNORS
FOR FLAT BELT
FOR V BELT
TO CARBURETOR LEVER
To control speed of any make of auto or truck engine, regardless of load changes, when used as a stationary or portable power plant. Fully guaranteed. No cash down. Governor speed range from 400 to 3000 R.P.M. Fine opportunity for established agencies. Send for free circulars. Mfrs. Candee-Smith Gov., Dept. 122-A, 215 No. Los Angeles Street, Los Angeles.

DANCE IN 5 HOURS
A whole family can learn from one set!
Realize your ambition—become a good dancer quickly, easily, *at home!* Arthur Murray's new picture course teaches you popular Fox Trot, Waltz steps, poise, balance, correct following, self-assurance. No music or partner needed. Write today enclosing $1 for six lesson introductory course. Try course 5 days. If not delighted with results, money promptly refunded.
$1.00
ARTHUR MURRAY, Studio 281, 7 E. 43 St., N.Y.C., N.Y.

Extend Holiday Greetings

[*Continued from page* 132]

is attached a 36-inch holly wreath. The wheel supports of the wagon are mounted on a platform and one wheel, from which the rubber tire has been removed, is equipped with strap iron brackets to which the wreath frame of wall board is attached. A circular wall board background on which the season's greetings are lettered is secured to the axle by means of a strap iron support and lock nuts. This portion of the display remains motionless.

Genuine holly leaves are tied with string to a piece of heavy burlap which is cemented to the circular wall board form, the reverse side of which is wired with four 50 watt colored lights. Current for these lights is supplied through two spring brass contacts which ride on two brass strips bolted to the rear face of the wreath. Small red Christmas tree lights secured to the face of the wreath to represent berries also connect to this current source.

A round leather belt traveling in the tire groove of the wagon wheel is connected to the speed reduction unit. Candy pail lids screwed together form the large pulleys of this unit while the smaller pulleys which are screwed to them must be turned on a lathe. Such a unit made to the dimensions given will reduce the speed of a motor from 2,000 R. P. M. to approximately 8 R. P. M. For slower speeds, or for motors of greater speed, another pulley unit may be added.

The snow covered face of the flashing "Merry Christmas" is made by molding Plaster of Paris over nails driven into a wall board background in simulation of the uneven contours of banked up snow. Over the opening, theatrical scrim is glued and backed up with a sheet of heavy cardboard in which the letters of the greeting has been cut out.

A single 100 watt bulb is located in each compartment and wired to the circuit breaker or flasher unit. The scrim through which the lights shine may be painted any color desired and the snow and circles of the face of the sign are painted white and covered with several thick coats of Silicate of Soda, or water glass, to give them the glossy appearance of frozen snow and ice.

A ½-inch strip of spring brass, bolted to the Bakelite panel of the flasher unit, is forced into contact with the head of a brass bolt as diagram shows by the passage of a ½"x½"x1" wooden cleat screwed to the surface of the revolving drum. To complete the circuit and to light one letter of the sign at a time.

Great Inventions

[*Continued from page* 45]

bought in stationery shops. Its pages are provisionally gummed, and need only be moistened to make clippings adhere to them. Hunting for a paste pot was always disagreeable to Mark. His third invention, patented in 1885, was for a game to help the players remember important historical dates.

Few names are better known than that of Cornelius Vanderbilt, but few realize that three out of the four Americans who have borne it were inventors. The first Cornelius Vanderbilt who began as a farm boy on Staten Island and established the first ferry service between the island and Manhattan, became captain, then owner of the first steamboat to navigate New York Bay and the Raritan River to New Brunswick. Then he began to build steamboats of his own design.

His grandson, second of the name, was not of an inventive turn, but the great grandson, the family's present head, General Cornelius Vanderbilt, is well known among railroad men for his inventions. He was trained as a mechanical engineer, and the Vanderbilt locomotive firebox has been for years standard equipment.

The latest Cornelius Vanderbilt, the General's

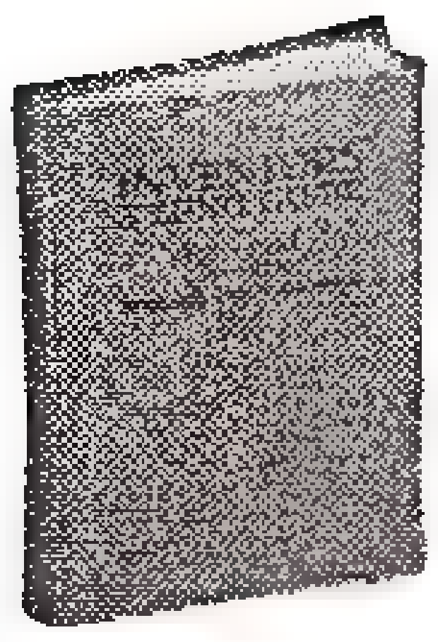
[*Continued on page* 136]

1,500 NEEDED INVENTIONS

1,500 NEEDED INVENTIONS

Concentrate your talents on inventions that will pay BIG MONEY. 1936 Edition of **1500 NEEDED INVENTIONS** by R. F. Yates tells what inventions manufacturers NEED badly. Describes in detail 1500 Needed Inventions in these fields: **General Problems; Automotive; Electrical; Mechanical; Chemical; Aviation; Radio; Marine.** Also chapters on the Ten Most Needed Inventions, and on new scientific discoveries important to inventors. Simple, practical ideas—one idea from this book may win you a fortune. If you want to invent, know what inventions will pay you the most money. This book tells you. Keeps you from working on inventions nobody wants to buy. Large cloth bound book, 250 pages, nine big chapters. **Only $2.50.** Drop a postal and we will send **1500 NEEDED INVENTIONS** C.O.D. We pay postage if you send cash with order. If not delighted after 5 days' examination, return it and get your money back.

INVENTORS' SELLING GUIDE



How and where to sell patented or unpatented inventions. **Inventors' Selling Guide** by R. F. Yates, noted authority on inventions, gives classified list of nearly **1000 manufacturers who buy ideas.** Tells how to sell unpatented inventions safely, how to sell chain stores, how to price inventions, selling by correspondence and demonstration, how to find buyers, etc. Tells what an inventor must know about **Law, Royalty, Contracts, Patents Pending, Financing, Gyp Schemes, Selling Methods. Cloth bound book,** 224 pages, 15 **chapters,** postpaid $2 (or C.O.D. plus postage.) **Satisfaction** guaranteed.

Also: Take Out Your Own Patents, $1.00

Making Unpatented Inventions Pay, 50c

BOTH BOOKS FOR $4.00

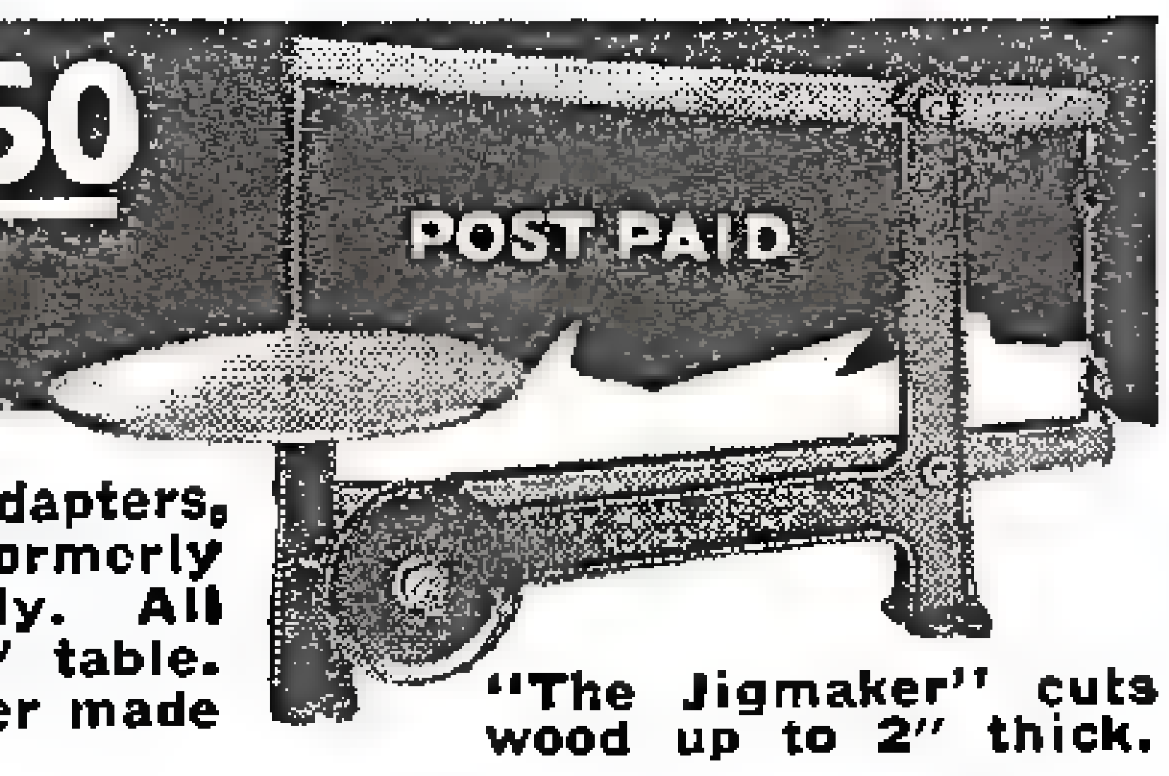
If ordered at one time

Write for FREE specimen pages and complete catalog of valuable books for inventors.

DONLEY PUBL. CO., 509 Fifth Av. Dept. M1, New York, N.Y.

JIG SAW $1.50

C.O.D or outside U.S.A $1.75



Including 12 assorted blades, Adapters, manual, and roller Saw Guide formerly found on expensive machines only. All metal, 15" long, 8" high, 6½" table. A swift and easy cutter—best ever made for the money.

"The Jigmaker" cuts wood up to 2" thick.

FREE catalog illustrating complete power tool line: Shaper, Circular Saw with oilless bearings, **$3** each; Drill Press, **$2.50**; completely equipped Lathes, **$2 & $3**; Sander, **$1**, etc. All practical tools for real work. Order today or send card for catalog.

J & H Metal Products Co. 8 Commercial St. Rochester, N. Y.

PARKS AIR COLLEGE

PARKS AIRPORT EAST ST. LOUIS, ILL.

Offers you college education majoring in aviation

Four 96-week courses lead to B. S. degrees in Professional Flight, Aviation Operations, Aviation Mechanics, Aeronautical Engineering. 100 acre airport. 14 buildings. 33 in faculty. 260 enrollment. 5,800,000 miles flight training. 1,520 planes. 509 engines repaired and rebuilt in shops. Graduates with all leading aviation companies. Dormitories, dining hall on field. Winter term Jan. 4th. Catalog. Write

10th YEAR

REGISTRAR, DEPT. MM-1
PARKS AIR COLLEGE, EAST ST. LOUIS, ILL.

New Remarkable! MIDGET POCKET RADIO

Little Giant
POCKET RADIO

BEAUTIFUL CLEAR LOUD TONE
DIRECT FROM POCKET RADIO!

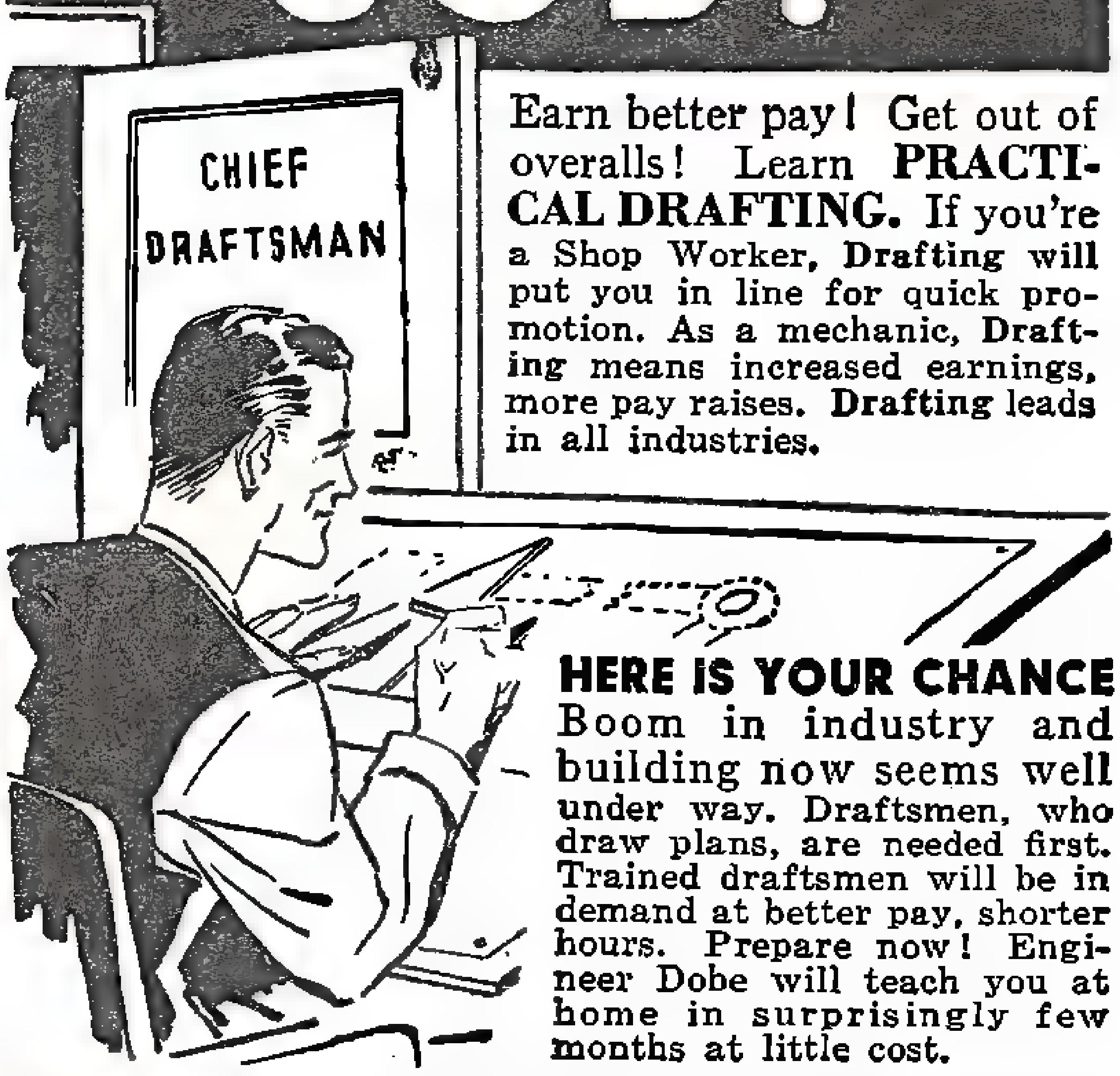
No Dangling Phones to Bother With. All one unit—just like the big sets, but weighs only 6 ozs. Fits pocket easily. Take it with you—listen to music, sports, radio entertainment, etc. No batteries, tubes or electrical connections required. **A Guaranteed** Pocket Radio.

EASY TO USE — WORKS IMMEDIATELY

Beautiful reception and tone. Accurately made, precisely assembled, rigidly tested, assures excellent performance. Tunes broadcast band. Costs nothing to operate and should last for years. Tuning control is the only moving part. Nothing to adjust. No difficult hook ups. Comes complete with built-in phone, ready to tune in, with easy instructions for use in camps, office, boats, picnics, home, hotel, bed, etc., and take it with you while traveling, in auto, bicycle, etc. **SEND NO MONEY!** Write for yours today. Play it as soon as you get it. Pay postman only $2.99 and a few cents postage. State color wanted (Silver, Brown, Black, White, Blue). An ideal gift. Amaze your friends.

Little Giant Radio Co., 3959 Lincoln Avenue, Dept. 603, Chicago, Ill.

DO YOU *want a better* JOB?



Earn better pay! Get out of overalls! Learn **PRACTICAL DRAFTING.** If you're a Shop Worker, **Drafting** will put you in line for quick promotion. As a mechanic, **Drafting means increased earnings,** more pay raises. **Drafting leads** in all industries.

HERE IS YOUR CHANCE

Boom in industry and building now seems well under way. Draftsmen, who draw plans, are needed first. Trained draftsmen will be in demand at better pay, shorter hours. Prepare now! Engineer Dobe will teach you at home in surprisingly few months at little cost.

The Road to Advancement DRAFTING

In every walk of life practical training in DRAFTSMANSHIP will prove valuable. Even if you don't accept a job as a DRAFTSMAN, you will be **money ahead** by taking Engineer Dobe's Course. You will be amazed at the speed with which you can learn in your own home in your spare time by Engineer Dobe's PRACTICAL METHOD.

JOBS NOW OPEN

In all industries, Drafting leads the way. In **Aviation, Electricity, Building, Machinery, Automobile,** Draftsmen must be used, and their work comes first. Recovery in industry and building is definitely on the way. Many trained Draftsmen will be needed on better jobs at better pay and shorter hours. Prepare NOW!

Learn at Home From an Engineer

I will teach you my practical method that has been successful with thousands since 1900. I will furnish you with all tools and a drawing table. I will teach you in a very short time by mail in your spare time **until you actually have a desirable Draftsman's job,** or prepare you for better pay in the job you now have. No High School or previous experience needed. You must be entirely satisfied with my personal training UNTIL COMPETENT and until assisted to a position, OR YOU GET ALL YOUR MONEY BACK. Start NOW and get the training. Prepare for more pay and a better job. Send the coupon below TODAY! Time is money! Don't delay! No obligations!

Complete Outfit
Size 20 x 25 Inches
FURNISHED

Free Book!

ENGINEER DOBE, Div. 4731 Libertyville, Ill.

Send me your free book, "Successful Draftsmanship" and explain how you will assist me to a good position as a draftsman.

Name.. *Age*..............

Address ....

Post Office.................................... *State*..............

Can You Equal This Home for $845

Shipped Direct from Our Mill

Save 30% to 40% on Your New Home..

WE PAY FREIGHT

Don't pay several hundred dollars more than necessary when you build a home! Buy it direct from our mill at our low factory price. We ship you the materials—lumber cut-to-fit, ready to erect. Paint, glass, hardware, nails, etc., all included in the price—no extra charges. We pay the freight. Plans furnished—also complete building instructions. No wonder our customers write us that we saved them 30% to 40%, compared with builder's prices. Easy terms —3 years to pay.

Handsome Big CATALOGUE FREE

Pictures wonderful homes in colors at money-saving prices. Designs to suit everyone.
Write for your catalogue today.
LEWIS MANUFACTURING CO.
Dept. 6871 Bay City, Michigan

Send for FREE BOOK of Liberty Homes

LEWIS MFG. CO.
Dept. 6871, Bay City, Mich.

Please send me, free of charge, a copy of your big 4-color Book of House Plans.

Name ....

Address ....

City ....State ....

Stoves AT FACTORY PRICES!

Sale Catalog—FREE

200 Styles and Sizes of Stoves, Ranges, Furnaces at Factory Prices, Easy Terms —as little as *18c a day.* More Bargains than in 20 Big Stores. New styles, new features, new colors. Year to Pay—30 days' free trial —360 days' approval test—24-hour shipments. 1,100,000 Satisfied Users. 37 Years in Business.

Write for FREE Catalog.
THE KALAMAZOO STOVE CO. MFRS.
403 Rochester Avenue
Kalamazoo, Michigan

"A Kalamazoo Direct to You"
Trade Mark Registered

HANDEE
Tool of 1001 Uses

Does away with slow hand work. Plugs in any light socket, A.C. or D.C. 110 v. 13,000 r. p. m. For home, shop or take to job. Uses 200 different accessories..grinds.. polishes..routs..drills.. cuts..carves..sands..saws ..sharpens..engraves.

For Faster Better Jobs

Get A Demonstration

at Hardware, Dept. Stores, Tool Dealers or order on 10 Day Money-Back Trial **$10.75** and up postpaid, 3 Accessories Free. De Luxe Model **$18.50**, with 6 Accessories. Catalog Free.

New CRAFTSMAN Project Book
"Pleasure and Profit with a Handee." Easy working plans for making many interesting and unusual projects 25c, stamps or coin.

CHICAGO WHEEL & MFG. CO., 1101 W. Monroe St., Dep. H. Chicago

Great Inventions

[*Continued from page* 134]

son and well-known journalist, figures in the Patent Office as the inventor of a shoe-polishing device. The device is about the size of a large fountain pen. Inside the barrel is a polish which feeds into a brush attached to one end, while concealed within, wound up like a roller shade, is a polishing cloth.

Colonel John Jacob Astor, who went down with the Titanic, patented a device for cleaning macadam roadways, doubtless arising from his experience with dusty roads about his country place at Rhinebeck-on-the-Hudson. It worked on the general principle of a vacuum cleaner. The Colonel dedicated his invention to the free use of the public, this gallant gentleman, like Washington and Jefferson, disdaining to accept money for his invention.

Colonel Charles A. Lindbergh and Dr. Alexis Carrel, author of the book-hit—"Man, the Unknown," have invented and are now testing out an artificial heart with synthetic blood stream, which aims to make it possible to keep vital organs alive and functioning outside the body.

Even royalty dabble in invention. Prince Henry of Prussia, brother of the former Kaiser, took out a United States patent on a "windshield wiper" just three months before the World War began.

Princess Elain von der Lippe-Lipski, now residing in Washington, is quite a prolific inventor. Recently three patents were granted her in a single day. One of these inventions, the Princess explained, involves usage of the red and violet rays to work with medical preparations by which surgical wounds that have taken as long as forty-five days to heal can be closed in from seven to ten days. Another is an automobile headlight which brightens and dims itself automatically.

The theater is well represented, too. Both Harry Houdini and Howard Thurston, magicians, knew that the only way to stop new-comers from taking the fruits of their labors was to patent the illusions which they performed.

Will Mahoney, of vaudeville fame, patented that odd musical instrument, the Mahoney-phone. And Jimmy Durante was able to register a trademark consisting of the word "Schnozzle," associated with his photograph and signature.

Charles Ray, the motion picture idol of a decade ago, is the originator of auto turn and stop signal lights, for which he received a patent as far back as 1919. The numerous patents to William Fox and David Wark Griffith, as might be expected, relate to photography and motion picture production. Lee de Forest, of radio fame, has been outstanding in the development of talking pictures.

Newton D. Baker, Secretary of War under President Wilson and a noted Cleveland attorney, last year patented a suction cleaner for

[*Continued on page* 138]

NOW! IT'S HERE! New, Remarkable MIDGET POCKET RADIO

MIGHTY MIDGET
POCKET RADIO
ON OFF
Just a Handful!

MIGHTY MIDGET TUBE RADIO CAN BE CARRIED WITH YOU!
Beautiful Clear Loud Tone Direct From Pocket Radio.

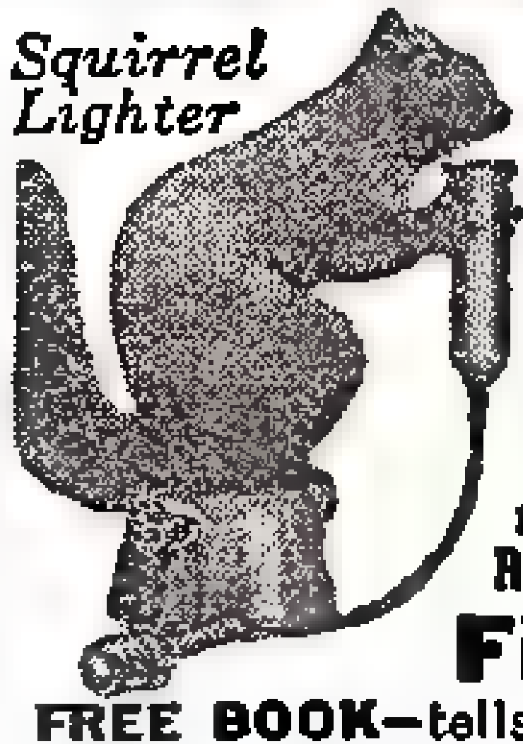
Fits pocket easily. All one unit—just like the big sets, but this LIGHTWEIGHT Radio measures only 5 in. x 3½ in. Take it with you—listen to music, sports, radio entertainment.

Easy To Use — Works Immediately
No Electrical Connections Required!

Beautiful reception and tone. Accurately made, precisely assembled, rigidly tested, assures excellent performance. Simplified, centralized tuning. Tunes broadcast band. Comes complete with phone in set, with easy instructions, ready to listen, in hotels, camps, office, boats, home, picnics, beds, etc. and take it with you while traveling, in auto, bicycle, etc. GUARANTEED. Nothing to adjust. No difficult hook-ups. Beautiful walnut color and modernistic design.

SEND NO MONEY! Play the Mighty Midget Tube Radio as soon as you get it. Get yours today. Pay postman on arrival only $3.49 and a few cents postage. Makes an impressive gift. Amaze your friends.
Mighty Midget Radio Co., 1951 Irving Park Blvd., Dept. 601, Chicago

WE CAN TEACH YOU TO **MOUNT BIRDS**



ANIMALS, HEADS, FISH

Also to tan skins and **FURS.** Easily learned **AT HOME BY MAIL.** Wild game growing scarcer—big demand. Be a taxidermist. Mount for others. Big Fun, Real Hobby. Mount common specimens — no wild game needed.

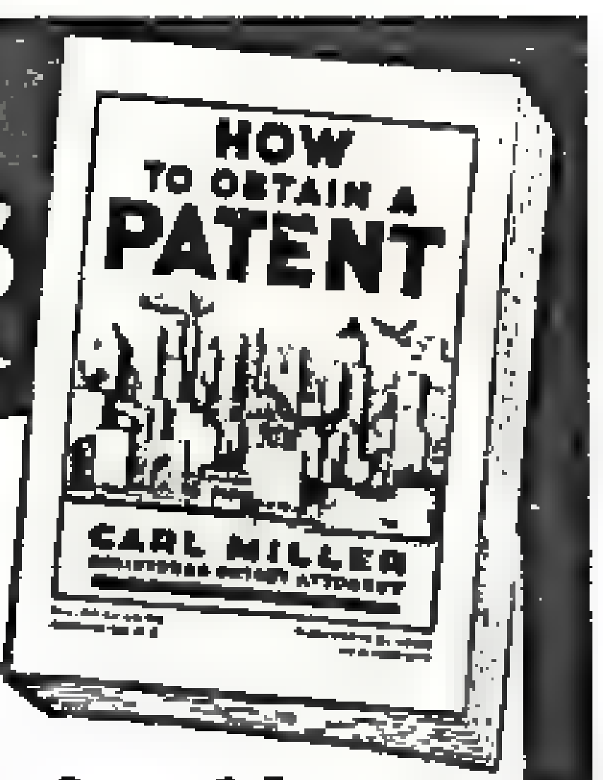
REAL PROFITS IN SPARE TIME.

FREE BOOK Men, Boys, get wonderful **FREE BOOK**—tells how **YOU** can learn this fine art quickly. Investigate. Send this minute. State **AGE.**
N.W. School of Taxidermy, Dept. 4731 OMAHA, NEB.

HAVE YOU A RADIO IN YOUR CAR?

Did you know that the *Radio Builders' Manual* describes a fine 6-tube auto set? Why not get a copy and build your own? Send 50c today to
MODERN MECHANIX PUBLISHING CO.
GREENWICH, CONN.

INVENTORS
PATENT YOUR IDEAS
SEND FOR FREE BOOK


HOW TO OBTAIN A PATENT
CARL MILLER

HOW TO OBTAIN A PATENT written by a Former Member of the Examining Corps (1922-24) of the U. S. Patent Office. If you want to profit by your idea, you should take steps to apply for a U. S. Patent at once. Your first step is to get this Free Book. This interesting illustrated book contains valuable information you should have. It tells you fully how to obtain a patent on your idea in the quickest way. With this Free Book you will also receive a "Record of Invention" form on which you can easily record your idea. Personal and Confidential Service: Your Case will be personally handled only by a Registered Patent Attorney who is also a Former Member of the Examining Corps of the U. S. Patent Office. All communications will be strictly confidential.

MAIL COUPON TODAY FOR FREE PATENT BOOK AND RECORD OF INVENTION FORM

CARL MILLER
REGISTERED PATENT ATTORNEY
FORMER MEMBER EXAMINING CORPS U. S. PATENT OFFICE

1638 Woolworth Bldg., Dept. 17B, New York City
Miller Building, Dept. 17B, Washington, D. C.

Please send me your Free Book, "How to Obtain a Patent," and "Record of Invention" form.

NAME ....

ADDRESS ....

LEARN AUTO MECHANICS in 8 weeks!

Earn $35 to $75 a week as an Auto Mechanic. Never in the history of the automotive business has there been such a demand for TRAINED men. 8 weeks training fits you for a job that's waiting for you or to open your own repair shop. Read what two McSweeny trained men have done. Hundreds of others can tell you facts equally interesting. Don't look for a job! TRAIN for it!

Farrell, Pa.
Dear Mac: Please forward me your catalog. I want it to add to my traveling souvenirs. I am working in a modern garage although I have been out of school only four weeks, thanks to McSweeny Training. My best regards to all. M. Klushauk

Rector, Ark.
Dear Mac: Just a few lines which might interest you. I left your school two years ago last May. Since I left I have not seen a day I could call "hard times." I have been working ever since I left and have averaged in my earnings $173.00 a month, in spite of the hard times. Many thanks. Thos. J. Sharp

EIGHT WEEKS of Actual Shop Training

No books or lessons the McSweeny way. First you learn the "why" of everything you do; then under competent instructors, you DO the job. You work on real equipment and machines, with the real tools of the auto expert. In eight short weeks you are TRAINED to hold down a permanent BIG PAY job. Any man 16 to 50 can learn. Write today for New Low Tuition Offer.

Diesel Engines and Aviation Ground Course!

Diesel and Aviation coming fast! Prepare now for the wonderful opportunities of the future.

MONEY BACK GUARANTEE!

Eight weeks of intensive training, actual shop work with real tools on real equipment, qualifies you for a Big Pay Job. If not satisfied, your tuition will be refunded.

FREE Write today for Big Free Book on AUTOS. Get the facts about jobs; and Low Tuition Offers. Mailing the coupon does NOT obligate you. It obligates ME to tell YOU how you can train for Big Money in eight short weeks. Address Dept. 11-37.

McSWEENY SCHOOLS
AUTOMOBILE-DIESEL-AVIATION
DETROIT, MICHIGAN or KANSAS CITY, MO.

Write Our School Nearest You

McSweeny Auto and Aviation School,
Dept. 11-37, Detroit, Mich., or Kansas City, Mo.

Without cost or obligation, send me your Big FREE Book; also full information about your Low Tuition Offer.

Name ....

Street ....

Town ....State .... Age ......

AUTO-MECHANICS & WELDERS

GOOD JOBS and Mighty GOOD PAY

Do you want to earn big money? If so let us know which of the following trades you prefer. You learn by doing. Practical work. Expert teachers. Low tuition. Personal attention. It will pay you to investigate AT ONCE. Just check the courses you'd like to take and mail today. You will receive full information, absolutely without cost or obligation. But don't delay.

Check the Trade You'd Like to Learn

☐ Auto Mechanics
☐ Auto Collision
☐ Metal Finishing
☐ Welding
☐ Spray Painting
☐ Torch Soldering

Name ....

Address ....

Mail the above to

MICHIGAN TRADE SCHOOL

Write for FREE CIRCULAR

3763 Woodward Avenue DETROIT, MICH.

BUILD YOUR OWN RADIO

Radio Builders' Manual contains 148 pages of instructions for constructing all-wave receivers, short-wave converters, automobile radio, and many other radio devices. Send 50c for your copy.

MODERN MECHANIX PUBLISHING CO.
GREENWICH, CONN.

BE INDEPENDENT!

Own and Operate an "Indoor Poultry Farm"

One man, formerly an accountant, is averaging $2,500 a year from his 1,000-bird "indoor poultry farm", installed in a remodeled commercial garage. Milton H. Arndt started this man and many others on the road to success.

Mr. Arndt, pioneer of the "indoor poultry farm" movement, and internationally known poultry specialist, has written a richly illustrated 160-page book entitled

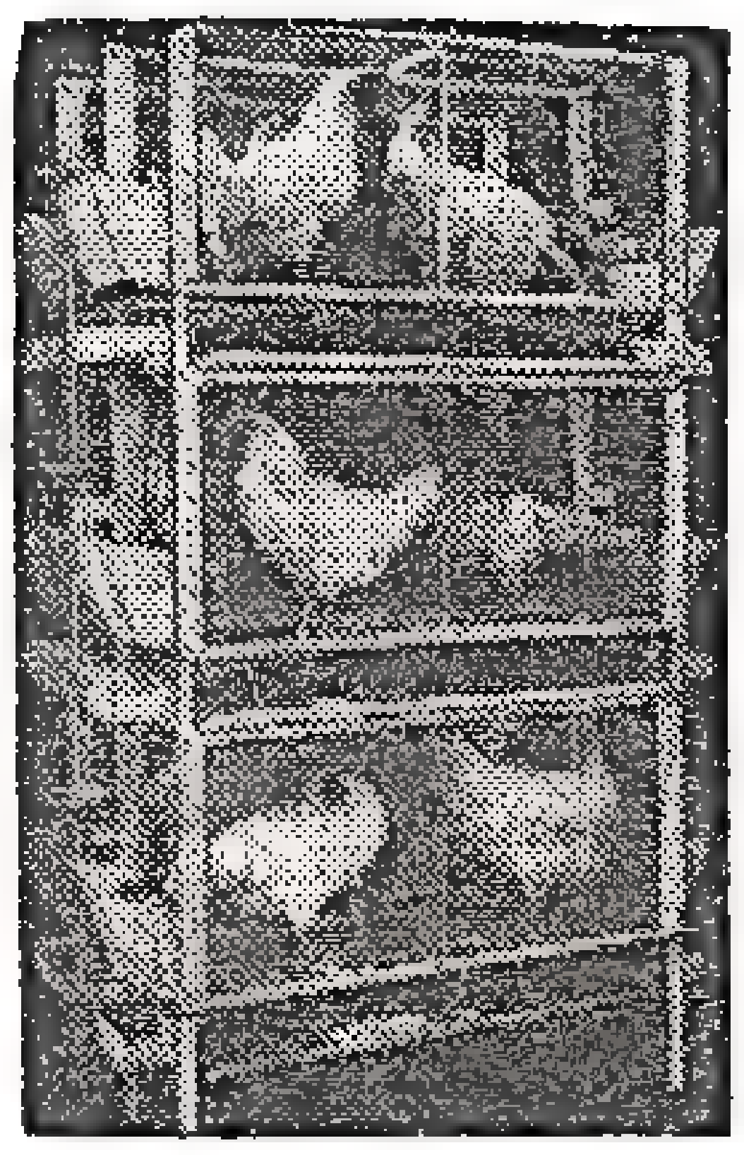
"A New Road to Independence"

Mr. Arndt shows how you can start in a barn, garage or empty loft and build up a flourishing business. How to sell super-quality fresh eggs and tender, delicious broilers direct to retail customers, also to restaurants, hotels and roadhouses.

This book will introduce you to a new, uncrowded vocation to which you can profitably devote part or full time.

Money-Back Guarantee

Send $1.00 today. We will mail you this book, postpaid. If not fully satisfied, return the book within 5 days. Your money will be promptly refunded.



An ARNDT 12-Hen "Egg Factory." Requires no more room than an ice box.

MILTON H. ARNDT Dept. B-60 Trenton, N. J.

Great Inventions

[*Continued from page* 136]

the dusting of books in cases. It is now being manufactured. Another attorney, Herbert L. Satterlee, brother-in-law of J. P. Morgan and former Assistant Secretary of the Navy, maintains a private laboratory in which he works on X-Ray and radio inventions.

Admiral Bradley A. Fiske, one of the heroes of the battle of Manila, since his retirement, has strayed from his chosen field to the extent of patenting several systems and apparatus for printing in extremely small characters, to be read through microscopes mechanically fed along the printing at any desired speed. The arrangement was intended to conserve space.

As the Marines always bob up where there is activity, it is not surprising to find General Smedley D. Butler was one of the pioneers in range finding apparatus.

That Arde Bulova takes out a patent for improvements in watches, or A. J. Reach for a baseball mask, or that Dr. Vannevar Bush patents an improved radio system, is hardly news. Neither is it news when Henry Ford patents another improvement in automobile structure; but few are aware that he has patented 100 such devices.

It was as late as 1930 that the patent laws were extended to embrace certain new forms of plant life. Among the first patents granted under the amended law was one to Harold L. Ickes, now Secretary of the Interior, for a dahlia. Two other plant patents have subsequently been granted to Mr. Ickes. As fate would have it, the new law took effect so near the end of Luther Burbank's career that only one patent was awarded him and that was granted after his death.

Women as inventors run largely to feminine or juvenile devices. Thus, Mrs. Winifred (Hudnut) Guglielmi professionally known as Natacha Rambova, patented a combined coverlet and doll shortly before the death of her famous former husband, Rudolph Valentino.

Mrs. Horatio Nelson Slater, famed as a leader in New York society, patented over twenty inventions. The profit from her inventions has been devoted to charity. Several of Mrs. Slater's patents relate to dolls. She also patented a military blanket, an automatic ice-case for refrigerators, a book cover and a couch and chair.

Other women have worked entirely in man's field. Mrs. Martha J. Coston invented the flare light used by mariners all over the world. Maude Adams, actress, has given much research and energy in attempting to develop motion pictures producible in daylight.

There is Miss Beulah Louise Henry, of New York City, who has received the soubriquet of "Lady Edison" for her many inventions, ranging from football valves on through a new type of sewing machine. Though her total of fifty patents may seem small compared with those of male

[*Continued on page* 150]

HANDY MAN'S HOME MANUAL

New 1937 Edition

ON SALE
NOV. 10

HANDY MAN'S HOME MANUAL
HOW TO MAKE
HOW TO REPAIR

144 Pages
800 Pictures

How To Repair—

Broken Furniture
The Home Radio Set
The Basement Furnace
Home Plumbing
and 1000 other items for the ailing home

How To Make—

All-Steel Auto Trailer
World Wide Radio
Colonial Furniture
Toys and Games
and other interesting home shop projects

50c *Get your copy now at your favorite newsstand or order direct from:*

MODERN MECHANIX PUB. CO.
Fawcett Building :: Greenwich, Conn.

ELECTRICAL BOOKS *shipped* FREE

10
BIG BOOKS

A·C·RADIO TELEVISION
EVERY ELECTRICAL SUBJECT COVERED

Here's great news for **anybody interested in Electricity.** BRAND NEW edition of Applied Electricity brought right down to date with every NEW Electrical subject fully covered. 10 big Volumes and all shipped **FREE** for examination.

For Beginners and Experts

Over 3000 pages—hundreds of illustrations—the most complete work of its kind ever published. Dynamos, motors, power stations, radios, television, everything electrical explained clearly so anyone can understand them.

BIG FIELD! Big Demand! Big Pay! Men who understand electricity are urgently needed right now in thousands of industries. Autos, airplanes, machine shops—practically every industry depends on electricity and men who know this subject make big money. Pleasant, fascinating work, easy to learn and do; learn quickly with these books. Send coupon for a set for FREE examination and see for yourself.

FREE A year's consulting membership in the American Technical Society now given free to all readers of this famous Cyclopedia of Electricity. Many say, "That's worth more than cost of books."

AMERICAN TECHNICAL SOCIETY
Dept. E-1320, Drexel at 58th St. Chicago

American Technical Society, Dept. E-1320, Drexel at 58th St., Chicago

Send for 10 days' free use, BRAND NEW 10 volume set of Electrical Engineering. In return for mailing this coupon promptly, send free certificate of membership in the American Technical Society entitling me to full consulting privilege for one year. I will pay the few cents delivery charges on the books. If I wish I may return them in 10 days and owe you nothing, but if I keep them I will send $2.00 after 10 days, then $3.00 a month until the special price of only $29.80 is paid.

Name --

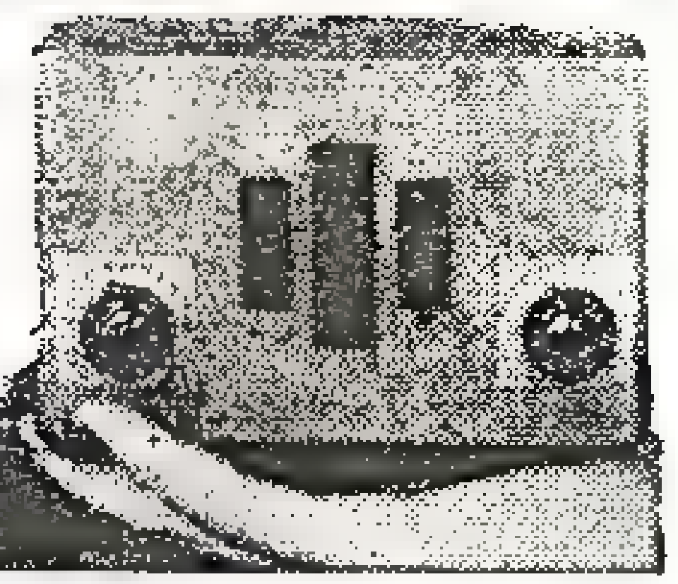
Address --

City ---------------------------------- State ---------

Please attach letter stating age, occupation and name and address of employer and at least one business man as reference.

MIDGET *Electric* RADIO

WORLD'S SMALLEST LOUDSPEAKER RADIO



Just a handful—Wt. only 1½ lbs. Size only 3½x5x2½. Has two multi-purpose hi-gain tubes, hi-efficiency coil and precision parts.—BUILT IN AERIAL! Midget BUILT IN speaker operates with beautiful clear tone and clarity on all stations on broadcast band and ALSO police calls! Actual four tube performance with real distance and punch for so tiny a radio. ALL ELECTRIC (Battery model available). Easily carried in a large pocket or tucked in suitcase. Ideal second or personal radio. Colors to match any room—beautifully finished breakproof cabinets. Only hi-grade parts used—a truly trouble proof midget. Late improvements. Users report wonderful reception in ALL PARTS OF THE WORLD. Uses 110 volt AC or DC current—any cycle. Kit of parts with tubes and diagram, $6.48. COMPLETELY WIRED and factory checked, 50c extra or $6.98 as shown. Send only $2.00—pay postman balance. Guaranteed to operate anywhere. Colors: White, Black, Brown, Blue, Green, (Battery model same as above complete with self-contained batteries same price). ORDER NOW!

SEND ONLY $2.00!

TINYTONE RADIO CO.
Dept. M-1 Kearney, Nebraska

Easy

What a thrill when you play your first tune *the very first week* on a P-A Sax. Then popularity . . . admiring friends, good times, a *glorious future.* Try a new model P-A Sax, Trumpet, Trombone, Clarinet at your local music store, or write for *beautifully illustrated* book. Finest instruments at amazingly low prices. Easy terms. Write today sure. 1245

FREE BOOK **PAN-AMERICAN BAND INST. & CASE CO.**
130 P-A Building ELKHART, INDIANA

SPEEDY 8 HOUR SERVICE ON ALL ORDERS. SEND 10c FOR OUR BIG CATALOG WITH ALMOST 600 PAGES OF BOOKS, NOVELTIES, TRICKS, USEFUL ARTICLES, ETC.

TALK-SING-PLAY thru your own radio

BROADCAST your voice on programs coming through your radio set--make announcements from any part of house--inject wise cracks, josh and mystify friends. "World Mike" made especially for home use, attached in a jiffy. Not a Toy. Also put on own programs at home, parties, club affairs. Barrels of fun! Easy to operate.

PRICE 25c POSTPAID

Johnson Smith & Co.
Dept. 366, Detroit, Mich.

RADIO MIKE

Large, substantial all-metal mike. Swell for practising radio singing, talking, amateur programs, etc. Reproduces the voice perfectly in loud clear tone without any distortion. Regular table model that can be held in hand. Guaranteed to work on any set. Easily connected in a few seconds. Price. . . . **75c** **Police Adapter.** *Get police calls on any radio.* 75c. **Noise & Aerial Eliminator 50c each.**

CRYSTAL RADIO 25c

This is a radio in itself, as it is possible to get reception with it alone within 25 miles of a station (or up to 100 miles under good conditions). All you need is an aerial & earphone. Completely assembled and wired, with supersensitive crystal, stand, base, crystal cup, arm with cats whisker, etc. Reception guaranteed. Only 25c ppd.

THRILLING POLICE CALLS

75c

ON ANY RADIO! Just attach the **Marvel Police Adapter** on any set. Brings in amateur short wave and police calls. No tools needed. Full directions. **ONLY 75c** *600page catalog10c*

Get One Today

RADIO BOOK

Tells how to make inexpensive crystal sets, electric sets, short wave radios, etc. Get foreign stations, police calls, etc. **Only 10c, ppd.**

JU-JITSU 30c

DON'T BE BULLIED

The Japanese art of self-defense. New methods of attack and defense are given. Illustrated so that you cannot fail to understand them. Deals fully with trips, throws, wrist locks, body holds, defense against revolvers, strangling, armlocks, scissors, splits, head lock, holding a man down, double knee throw, stick attack, defense against knife, one hand throat grip, defense against two assailants, stomach throw, secret thumb knockout, nerve pinches, and numerous others. Learn to protect yourself under all circumstances with nature's weapons. Fear no man, guns or knives! "Science of Ju Jitsu" Only 30 cents postpaid.

CHAMELEON 25c

WATCH IT CHANGE COLOR!

Get one of these most wonderful of all creatures. Watch it change color. Study its habits. Wear one on the lapel of your coat as a curiosity. Shoots out its tongue to catch flies and insects for food. No trouble to keep. Can go for months without food. About 4 in. long. Shipped to any address in U.S.A. by mail. We guarantee safe arrival and live delivery. **Only 25c ea.**

STAGE MONEY

With a bunch of these bills, it is easy for a person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll. The effect created will be found to be all that can be desired. **Prices, postpaid: 40 Bills 20c, 120 for 50c, or $3.50 per thousand postpaid.**

250 Magic Tricks

MAGIC MADE EASY

An excellent little book containing 250 Parlor Tricks, tricks with cards, coins, handkerchiefs, eggs, rings, glasses, etc. So simple that a child can perform them. Profusely illustrated. Entertain and amuse everybody. **Only 10c postpaid.**

LUMINOUS PAINT

LUMINOUS PAINT, when applied to an object, emits rays of white light, rendering it visible in the dark. The darker the night-the brighter it shines. Simple to use-you can do it! Apply some to the dial of your watch so you can tell time at night. Paint push buttons, switches, anything, everything with it. **Small bottle 25c, Medium Size 50c, Large Size $1.00, postpaid.**

WONDERFUL X-RAY 10c

GREAT CURIOSITY! With it you can apparently see the bones in the fingers, lead in a pencil, even the flesh seems transparent. Always ready for use. The price is **Only 10 cents postpaid.**

X-RAY

BIG ENTERTAINER

526 Jokes & Riddles, 25 Tricks, 10 Parlor Games, 73 Toasts, 13 Stories, 105 Money-making Secrets, 22 Monologs, 21 Puzzles, Problems, Comic Recitations, Funny Readings, 11 Parlor Pastimes, 13 Flirtations, 1110 Names & their Meanings, 10 Picture Puzzles, 37 Amusing Experiments, Deaf and Dumb Alphabet, Shadowgraphy, Fortune Teller, Fortunes with Cards, Crystal, Tea Cup, etc. Hypnotism, Ventriloquism, Cut-outs for Checkers, Chess, Dominoes, Fox and Geese, 9 Men Morris, Spanish Prison Puzzle, Anagrams, 25 Card Tricks, Crystal Gazing and 100 other things for only 15 cents postpaid.

BLANK CARTRIDGE PISTOL

REVOLVER STYLE **50c** **$1.00**

Two new models now out, at 50c and $1.00. Well made and effective. Patterned after latest type of Revolver. Appearance alone will scare a burglar. Takes 22 Cal. Blank Cartridges obtainable everywhere. Great protection against burglars, tramps, dogs. Have it lying around without the danger attached to other revolvers. Fine for 4th of July, New Year's, stage work, starting pistol, etc. Two sizes. **Medium size 50c. Large size $1.00. Blank cartridges 50c per 100. Holster (cowboy type) 50c Shipped by Express only, not prepaid.**

Hi-Powered Air Pistols

Shoots B. B. Shots

A powerful high grade Air Pistol shaped like an Automatic, pocket size. Fires B-B shot obtainable anywhere. Very powerful yet perfectly safe for boys to handle. Two styles: Single Shot Pistol or Repeater. The Repeater fires 100 shots in one loading. The Single Shot shoots Air Rifle Darts and B-B Shot. Well made and durable; all metal parts nickel plated; natural grain wood stocks. Front and rear sights. Better than an air rifle. Shipped by express. Not prepaid. **Single Shot Pistol $2.50; 100 Shot Pistol $5.00.**

REPEATING SLING SHOT

Automatic repeating slingshot that will fire 150 shots with one loading! Designed for accuracy. Bulls eye every time. Extremely powerful and hard hitting-will go through a 100 page magazine. More powerful than an air rifle. Sturdily constructed with non-slip suede leather shot holder and thick lively cords. Will shoot everything from rocks to BBs, but the magazine is made to hold 150 BB's, enough for a full day's fun. Carry one of these on your next hike. **Slingo**, the repeating slingshot, only **25c postpaid. Tube of 200 Copper-coated BB's, 10c.**

GoodLuck RING

Very striking, quaint and uncommon. Oxidized gunmetal finish; skull and crossbones design; two brilliant flashing imitation rubies or emeralds sparkle out of the eyes. Said to bring good luck to the wearer. **PRICE 25c Postpaid**

MIDGET RACER

25c

This racer was designed to answer the demand for a simplified midget racing car. Built from parts you can get from junk dealers, it costs only a few dollars. Every part illustrated in the comprehensive blue-prints, so that it is almost impossible to go wrong. Simplified gear shift, brakes, steering, etc., etc. In fact every thing has been designed to answer the demand for a simplified midget racing car that is economical and speedy. Start building now. Book of plans, blue-prints, **25c.**

New Vest Pocket Adding Machine

Adds, subtracts, multiplies, divides. Does work of a costly machine. Ten million capacity. Simple and accurate. **NOT A TOY.** Easy to operate. No keys to punch, no lever to pull. Total always visible. Guaranteed for 5 years. Lightning calculator and time saver. Constructed of steel, ensuring strength, durability and reliability. Lasts a lifetime. Compact and light. Weight 7 ounces. Will fit right in vest pocket and can be carried about without inconvenience. Size 3x6 in. **PRICE POSTPAID $1.50**

PEAMATIC

HARMLESS ACCURATE **25c**

Here it is, boys! It shoots 12 to 15 ordinary peas without reloading. Just load the gun with peas, pull the trigger and keep on firing until the barrel is empty. Then reload and fire again. It is absolutely harmless and safe. They sell like hot cakes, so get one now. Ten times better than the old fashioned bean blower. Shoots far and accurate. **Complete with target. ONLY 25c. Holster with belt for Peamatic only 25c.** *600 p. catalog 10c.*

Pistol Cigarette Case

Hands Up!

It looks like a deadly weapon, but it is merely a novel Cigarette Case. Better than the real thing in many an awkward encounter. Great fun "sticking up" your friends. They squirm and protest. Pull the trigger and the slide flies open, disclosing cigarettes. **price 25c**

BOYS! BOYS! BOYS!
THROW YOUR VOICE

Into a trunk, under the bed or anywhere. Lots of fun fooling teacher, policeman or friends. The **VENTRILO** a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it. Never fails. A 64 page course on Ventriloquism together with the Ventrilo. All for only 10 cents postpaid.

TYPEWRITER

$2.50 Complete

The American Flyer Typewriter is patterned after standard machines. Writing always visible as in larger machines. Capitals as well as small letters, punctuation marks, etc. Writes 68 characters. Standard typewriter ribbon, self-aligning paper feed, and sliding carriage. Accomodates full size sheet of letter paper up to 8 1-2 inches wide, any length. Produces neat and attractive writing. You soon familiarize yourself with the arrangement of the keys so that after a short time you naturally acquire speed. Standard characters are used. Heavy gauge steel, electrically welded and rivited. Finished in lustrous black and colored enamel. Size 6 x 7 1-2 x 11 in. **Price $2.50.**

HOW TO TAP DANCE

PRICE 25c

Why envy the easy rhythm and fascinating grace of Step'n Fetchit, Fred Astaire etc. Tap dance in ONLY 6 HOURS by a new, simplified course by Prof. Wilson. No special ability needed. Be smart! Everybody's tapping. The whole town is tapping. Beat out a tune with your feet. Hostesses love it. Friends adore it. Besides, tap dancing is not only invigorating and entertaining but is also health-giving exercise for making the limbs supple and giving a "springy" feeling of fitness to the whole body. Promotes slimness nature's way, without pills, drugs or dieting. Readers say: ". . .wonderful benefit. Thank you for adding tap dancing to my accomplishments."

PRICE 25 CENTS POSTPAID.

DANCING

25 Cents

LATEST STEPS. Be popular. Good dancers are always admired--always popular guests. Partners welcome them eagerly. The newest, smartest steps without a teacher. Don't make excuses when the music starts. Get lots of fun from parties and dances. If you want to become a perfect dancer, learn to dance at home this new, easy way. **BOOK TELLS:** How to develop poise and control, improve your dance steps, art of holding, how to walk to music, how to lead, latest Fox Trot steps, Natural and Reverse Turns, the Reverse Wave, the Quickstep, swaying to music, Waltz, Backward Changes, the Continental, the famous Kiss dance, the Manhattan, the College Rhumba, the Cario, Charleston, and many others. **Art Of Dancing. Price 25 Cents Postpaid.**

STEAM ENGINE 25c

World's biggest value in mechanical toys. A great big steam engine, 7 inches high by 2 1-2 inches in diameter. Watch it run, too! It's fun to see the fly wheel spin around and hear the engine puffing when you get the "steam up." Just light up, fill the boiler with water and in a few minutes the engine is blazing along at top speed! Runs for hours on one filling and will drive many small toys off the fly wheel. Foolproof, harmless, fully tested and guaranteed to run. The engine is beautifully lithographed in several colors. Easily worth a dollar. New model which runs on alcohol or canned heat **only 25c, add 10c for postage and packing.** *Electric Model, 35c plus 10c for postage and packing.*

CCC RING

Here is a splendid ring for every boy to wear! The CCC Ring, just like those who work for Uncle Sam have. Nicely finished with the American Eagle on both sides of the shield. Silver finish with emblem enameled in red, blue and gold. $1.00 value. Price, **25c**

WONDERFUL INSTRUMENT

LOOK **35c**

Nine separate articles in one. Odd, curious and interesting. Lots of pleasure as well as very useful. Double Microscope for examining the wonders of nature. Opera Glass, Stereoscope, Burning Lens, Reading Glass, Telescope, Compass, Pocket Mirror, and Laryngoscope for examining eye, ear, nose and throat. Worth its cost to locate one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Only 35c ppd.

MAGIC FLUTE

10c

New patented musical instrument. Wonderful invention: nothing like it. You can be a real musician and play all the latest popular songs, ragtimes, old time ballads, sacred hymns, dance music; also fine for piano accompaniment. There is no fingering, and once you have mastered it you can play all kinds of music with facility and ease. Sure to please. **Price 10c, 3 for 25c ppd.**

ADDRESS ALL ORDERS FOR GOODS ON THIS PAGE TO

JOHNSON SMITH & CO.

DEPT. 366 **DETROIT, MICHIGAN**

Send 10c for our NEW CATALOG, or 25c for the DELUXE EDITION with permanent cloth binding. Bigger and better than ever. New items - different items - things that you never thought existed - articles you always wanted but never knew where to get. Nearly 600 pages of magic tricks, latest novelties, joke goods, useful time savers, seeds, unusual books, sporting goods, puzzles, games, etc., etc. Novelties, Illustrated.

FIELD GLASSES 25c

WOW! What a bargain. Real, genuine Field Glasses with **six power magnification.** Center piece quick, one finger focussing. Permits full, unhampered, two-eyed vision that gives remarkable scope and clarity. Swell for nature study, hiking, sports and a million other things. Complete with cord, packed in box. **Only 25c**

ELECTRITE PENCIL

Electrite Pencil writes in gold, silver, red, yellow, purple, green, blue, etc., on leather, wood, paper, bakelite, cellophane, silk, rubber, etc., etc. Put your name, monogram or initials in gold or any other color on your car, wallet, golf clubs, fountain pen, stationery, etc. Print and decorate anything. Live-wire boys and girls can earn extra cash easily by doing this for other people. Every time you print a name or monogram on an article you can easily get 25c for it, yet it costs almost nothing except a few seconds time! Easy to use. Just plug in electric light socket and the pencil is ready to write. **ELECTRITE PENCIL**, complete with supplies for writing six colors. Price **$1.00**

MAGIC

Pocket Telescope

***Eagle-Eye Vision* Six Power 25c**

Big 3 draw, 6 power telescope for only **25c!** Swell for outdoors, nature study, sports, looking at the moon, etc. Converted into **solar telescope** by using smoked glass so you can see sun spots, etc. Optically ground lenses. 6" long. Nickeled drawers, packed in box. **Price 25c.**

THRIFT VAULT

50c

A 3 dial safe lock and Vault Bank. Just dial the three numbers and open the vault just like any safe. Big and roomy - it measures about 4x8 inches. Swell to keep your money, jewelry, etc. etc. in. Constructed of heavy metal with red and black trimmings. Full instructions with each bank. **VAULT BANK only 50c postpaid.**

THRIFT VAULT Similar in appearance to the above only made of welded steel, and slightly larger. Packed in a box, with complete directions for opening. **Price $1.25 Postpaid**

5 Master Keys

Did you ever loose or forget your keys? Probably many times. Don't worry any more about lost keys (or any keys, for that matter), as these master keys will open almost any ordinary lock. Five different keys for various types of locks. Will save their cost if you only use them once, but you'll probably find them so handy that you'll always carry them. See if locks are burglar proof. Complete set of five skeleton keys **25c.**

125 CARD TRICKS

Contains all the tricks and deceptions with cards ever invented. Including the tricks of the most celebrated Conjurors, Magicians and Prestidigitators. Simplified and adapted for home amusement and social entertainments. Complete exposure of all the card tricks by gamblers. How "skin" gamblers cheat and win money by their infernal "palm fling," and other tricks. **Price 25 cents postpaid.**

40 DIFFERENT ARTICLES FOR 50c

No less than 40 different articles! Just a few of them: Disappearing Coin Trick, Invisible Ink, Lookbackroscope, Magnetic Top, Police Badge, Book of Tricks, Jokes, Games, 3 Card Tricks, Bird Warbler, Pill Puzzle, Magnet, Nail Puzzle, Key Puzzle, Nose Blower, Celluloid Glasses, Gold Tooth, Whistle, Oriental Finger Trap, Frog Snapper, Secret Photo, Back Seat Driver Card, Liar's License, Trick Pencil, Compass, Balloon, etc., etc. A great big grab bag! The latest jokes, tricks, novelties. The wonder packet. **SURPRIZE PACKAGE. Complete for only, 50c**

NOVEL CIGAR LIGHTERS

15c

Pencil Bullet Cigarette Key *Your Choice!*

Four unique Lighters are illustrated above at the low price of **15c each.** Full sized pencil & lighter; key; bullet; and one which looks like a Cigarette--will fit into your cigarette case! Your choice, only **15c each.**

DANCING SKELETON

10c ppd.

A jointed figure of a skeleton 14 in. in height, will dance to music and perform various gyrations and movements while the operator may be some distance from it. It will lie down, stand up, dance, etc. We send full and complete instructions. Price 10 cents, 3 for 25 cents postpaid.

MOTTO•RINGS

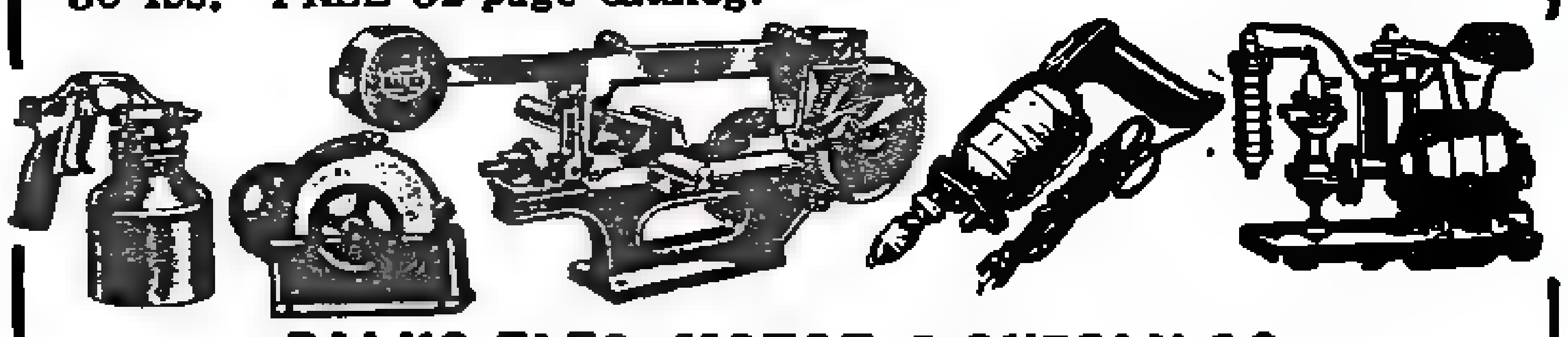
25c

Lots of harmless fun and amusement wearing these rings. Make the girls sit up and take notice! Made in platinoid finish (resembles platinum), with wording on enameloid as illustrated. **25c each ppd.**

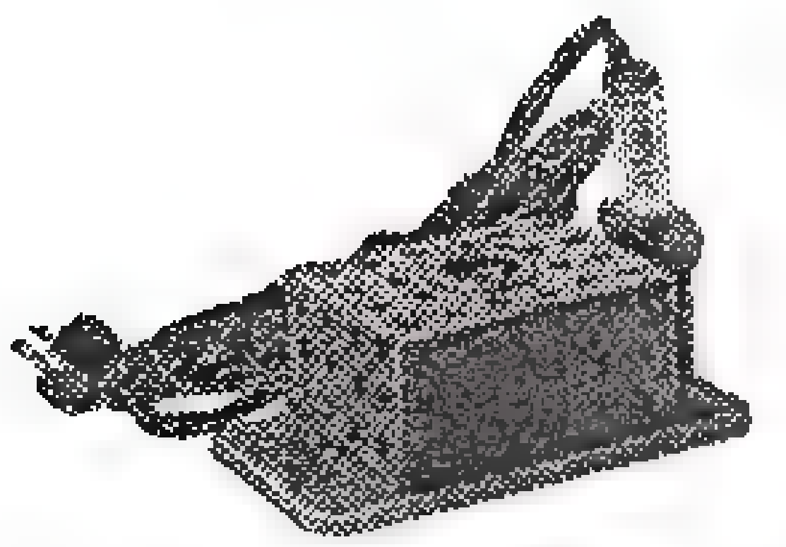
INVISIBLE INK, CAN BE READ ONLY BY THOSE WHO KNOW THE SECRET, USED BY SPIES, ETC. COMPLETE DIRECTIONS. 10c PER BOTTLE

NEW SCREW FEED METAL TURNING LATHE only $10.95

No. 355—6x18" METAL TURNING LATHE WITH LONGITUDINAL SCREW FEED. Length overall 30". Machined semi-V ways. Threaded hollow spindle. No. O MORSE TAPER CENTERS. 4-step pulley mounted between TWO BRONZE BEARINGS. TAPERED TAKE-UP BEARING. ½" tailstock set-over. Compound carriage travels on semi-V ways gibbed for take-up. Compound swivels thru 360°. Included: Two 60° centers, tool post assembly and 4" face plate—3" four jaw chuck $3.50; 4" chuck $4.50; Chuck adapter bushing 50 cents. Tapered arbor with flanges and nut and ¼" chuck 89 cents. Send $2.00 with order, balance C. O. D. Shipping weight 30 lbs. FREE 32-page catalog.



BALKO ELEC. MOTOR & SUPPLY CO.
Dept. B1, 10 S. Clinton St. Chicago, Ill.



WELDING TORCH LIGHTER

AUTOMATIC — ELECTRIC

Open torch valve slightly—Tap the Magic-Button—It's Lit

A quality product, designed to give years of service—insulated against electrical shocks, safer than matches, less troublesome than flint lighters also faster and cheaper to use than either. For Bench Mounting **ONLY.** Cost of operation so small it could hardly be measured. No jump-spark. 110 Volt Model illustrated! Satisfaction Guaranteed or Money Refunded. $5.00 Postpaid. Other Voltages on request. If Your Dealer Cannot Supply You—Order Direct.

FLEMING MANUFACTURING CO. XENIA, ILLINOIS

Learn Public Speaking

At home—in spare time. Many overcome "stage-fright," gain self-confidence, and increase their earning power, through ability to sway others by effective speech. Write for free booklet, *How to Work Wonders With Words* and requirements.

NORTH AMERICAN INSTITUTE, Dept. 2051
3601 Michigan Avenue Chicago, Illinois

---

60 ART LESSONS

Only $1.95 POST PAID COURSE COMPLETE

Become Talented Artist with Big Income

This thorough course by Alexander Murray, famous Art School Instructor, makes it easy to learn art in spare time. Teaches commercial art, cartooning, lettering, anatomy, perspective, adv. layout, etc. without bother or expense of corresponding. You get all 60 lessons at once—no waiting for next lesson. Over 815 Instruction Illustrations. 125 pages of drawing paper **FREE** if you order from this ad. Send only **$1.95** for Complete Course postpaid—or pay postman plus postage (U. S. A. only). **MONEY BACK** if not delighted after inspecting.

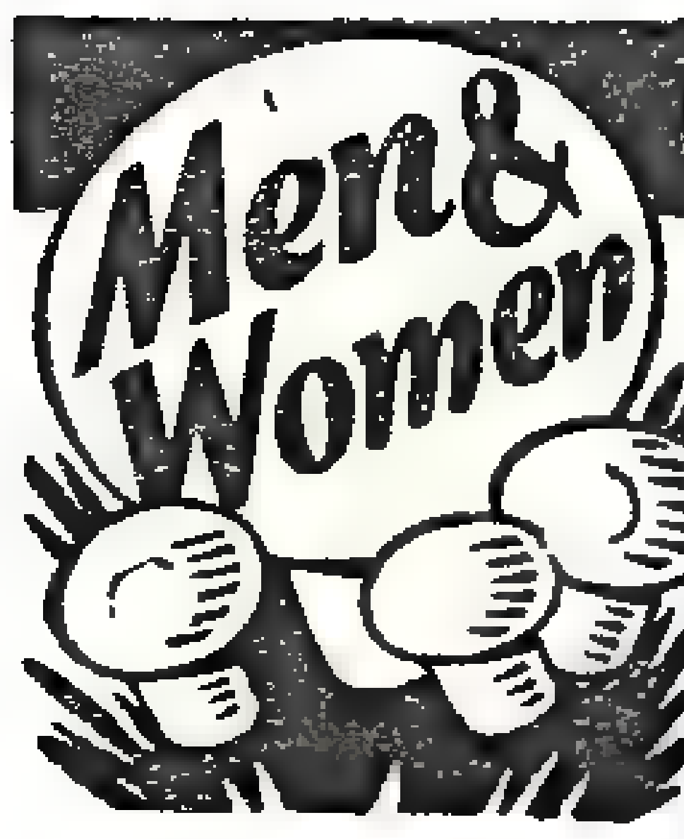
EDUCATIONAL SUPPLY CO. Dept. A113-A Racine, Wis.

FREE BLUEPRINT BOOKLET!

The 1937 MM Blueprint Catalog contains more than 100 illustrations and descriptions of boats, camping trailers, light planes, radio sets, furniture, models, auto racers and dozens of workshop projects for which blueprints are available. Send three cents for your copy now.

Send stamped, addressed envelope to

MODERN MECHANIX PUBLISHING CO.
Fawcett Bldg. Greenwich, Conn.



Earn Cash at Home!

We paid M. M. $267 in 3 weeks for exceptional "cellar crop" patented mushrooms! Big free picture book tells if your cellar, shed, barn suitable. We buy all crops thru ten branches. Write today. (Estab. 1908.)

UNITED MUSHROOM CO.
3848 Lincoln Ave., Dept. 77 Chicago

The Marvel of the Radio Industry *New* MAGNA-SPAN DIAL *and* VITA-TONE SPEAKER *in the Sensational 1937* *Knight* RADIOS

38 Models 5-19 Tubes as Low as $8.45

SEE THEM IN YOUR ALLIED CATALOG

America's most amazing radios! The latest developments in radio—new Giant Magna-Span dial, Flywheel Tuning, mighty "Vita-tone" speakers, "Electric Eye", Visual-Wave Band Indicator, perfected metal tubes, etc. Tone quality, sensitivity, selectivity, all-around performance, that again proves what tremendous values only ALLIED can offer. All-Wave, Dual-Wave and Short-Wave—5-19 tubes—AC, AC-DC, 6-volt, 32-volt, battery and auto sets. See all 38 models in ALLIED'S Free Catalog!

Everything in Radio at Lowest Prices

Besides the amazing new Knight Radios, ALLIED'S 152-page Catalog includes the latest Amateur Transmitters, receivers and transceivers; newest Public Address equipment for every Sound need—Over 10,000 exact duplicate and replacement parts—Latest test equipment; Rurlpower units and Windchargers—and dozens of new Kits for Set-Builders. You'll always find greatest values in your ALLIED Catalog. If you don't have one, send coupon now for your Free Copy.

Free Parts Lists

Write to us for Free parts lists covering Vest Pocket Radio; Hitch-Hikers' 2-Tube Portable; Musical Derby; Crystaldyne; Match Box Radio; Bicycle Radio; Knight Super Gainer; 1-Tube Oscillating Detector; Metal Tube DX'er; and many others. We can supply matched kits for building any Modern Mechanix circuit.

FREE CATALOG

Allied Radio
RADIO'S LEADING SUPPLY GUIDE

ALLIED RADIO CORP.

833 W. Jackson Blvd., Chicago, Ill., Dept. 6-A

☐ Rush me a Free Copy of 1937 ALLIED Catalog.

☐ Send me Free Parts List for ....

Name ....

Address ....

City ....State ....

Classified Advertisements

Rate for classified ads, 18c per word (include name, address and all numbers) per insertion. Minimum 10 words. Cash must accompany order and be received in this office December 3rd for the February, 1937, issue (on sale December 29th). Address Classified Mgr., Modern Mechanix, Hobbies & Inventions, 1501 Broadway, New York City

A. C. GENERATORS

PRACTICAL changes for automobile generators. See our advertisement at bottom of page 27. Autopower, Inc.

ADVERTISING AGENCIES

LEARN advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 2048, Chicago.

ADVERTISE: Get mail-order business, agents. Free assistance. Free Ad-Guide of newspaper, magazine, circulations, rates, mailing-lists. Chicago Advertising Agency, 22 West Jackson, Chicago.

ADVERTISE: 24 words in 250 newspapers $10. Lists Free. Advertising Service Bureau, 4258-B Drexel, Chicago.

FREE NEW advertisers rate guide. Brown Advertising Agency, 140 South Dearborn, Chicago.

AGENTS WANTED

I WANT MEN for local Tea and Coffee routes. Make up to $42.50 first week. Automobile given producers as bonus. No experience needed but must give prompt service to families on your route. I send everything; no money risk. Write Albert Mills, 2233 Monmouth, Cincinnati, Ohio.

BIG MONEY and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 11, Dunellen, New Jersey.

AGENTS: Smash go prices. Santos Coffee 12c lb. 4-oz. Vanilla 8½c. Razor Blades 10 for 8½c. 100 Sticks Chewing Gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., MN., St. Louis, Mo.

$6.85 HOURLY!—Amazing No-Flatz fixes punctures without patching; makes tires puncture-proof! Instantly, permanently seals holes made by nails, etc. Big seller. Free sample offer. No-Flatz, Dept. K-164, Cincinnati, Ohio.

$6.00 HOURLY. Amazing Karnu Refinishes autos like new without rubbing, polishing, waxing or painting. Wipes on with cloth. Lasts 8 to 12 months. Free Sample, Karnu, Dept. K-84, Cincinnati, Ohio.

MAKE More Money Selling Shirts, Ties, Underwear, Dresses, Hosiery, Raincoats, Jackets, Pants, Uniforms. Sales Outfit Free. Nimrod Company, Department 132, 4922-28 Lincoln Avenue, Chicago.

START Bargain Business. Large profits. New and used clothing. Bankrupt and auction sale merchandise. Experience unnecessary. Everything supplied. Publix, 568-KH Roosevelt, Chicago.

AMAZING New Product plates with real silver. Fast sales to housewives—big profits—one minute demonstration. Write quick for details. Puritan Laboratories, 1612M Summit, Akron, Ohio.

WHERE To Buy At Wholesale 500,000 articles. Free Directory and other valuable information. Maywood MM. Publishers, 925 Broadway, New York.

BE Your Own Boss! Operate used-new clothing business from store, home, auto. 200%-300% profit. Everything furnished. Catalogue FREE. Portnoy, 566-AL, Roosevelt, Chicago.

WHY Work for Others? Make and sell your own goods. Formulas, Toilet Articles, Perfumes, Extracts. Valuable book Free. Scientific Laboratories, 1959W Broad, Richmond, Va.

AGENTS—Lowest Prices—Top Profits on carded Aspirin, Razor Blades, Handkerchiefs, Laxatives, Shoe Laces, etc. Details Free. Better Products Co., Dept. 2719, Marion, Ind.

1000 BARGAINS, Drygoods, Notions, Drug Sundries, Specialties, Novelties. Agents undersell stores. Free catalog. Jobbers. Dept. 1398-A, 930 W. Roosevelt, Chicago.

BIG Money Applying Gold Initials on Automobiles. Easiest thing today. No experience needed. Free samples. "Ralco", 1084 Washington, Boston, Mass.

GOLD Reflecting Letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941-G Halsted, Chicago.

GOOD Income Plating Auto Parts, Reflectors, Mirrors by late method. Free particulars and proofs. Gunmetal Co., Ave. A, Decatur, Ill.

NO BOSS! Sure Cash! Silvering Mirrors, Autoparts, Reflectors. Combination outfit. Write, Sprinkle, Plater, 850, Marion, Indiana.

AMAZING Cleaner; Cleans Everything. Whirlwind 25c Seller. Profit 17c. Sample Free. Super-X, 15, Berwyn, Ill.

MONEY-MAKING personal hygiene specialties that really sell and repeat. Liberal profits. Write Pat Faris, Tomball, Texas.

LEGITIMATE spare-time income opportunities. Free literature. Charltoc, Box 6310 West Market St., Philadelphia, Pa.

AGENTS' Gold Sign Letters for store windows. 500% profit. Free sample. Metallic Letter Co., 426 N. Clark, Chicago.

PUNCHBOARD MEN—Put and Take Jars. Samples, details free. Tom Thumb, Dept. MM, Nauvoo, Ill.

SELL Novelty fun cards, novelties, etc. Samples, list 10c. National, Box 500H, Cincinnati.

AMERICAN POLICE JIU JITSU

13 KNOCKOUT Blows without use of fists, by internationally famous Jiu Jitsu instructor. Send 15 cents. S. J. Jorgensen, 278 Maritime Building, Seattle, Washington.

ARCHERY

RAW Materials, finished tackle, complete line. The Hobsons, Salem, Oregon.

AUSTRALIAN OPALS

OPALS. Lovely colours. Beautifully illustrated catalogue postfree. Norman Seward, Melbourne, Australia.

AUTOMOBILES

NEW book covering every detail of auto electric system, including magneto ignition. Step by step trouble shooting. Questions and answers. One dollar postpaid. Satisfaction or money refunded. Allen Electric Manual, Dept. M, Box 83, Detroit, Michigan.

GUARANTEED Anti-Freeze Formula 50c. Absolutely safe, uninflammable, rustproof. One mixture for any temperature. Costs 5c gallon. Contains no alcohol or glycerine. General Products Company, Box 141, Terre Haute, Indiana.

POWER and speed equipment for Fords—Chevrolets and other cars. Midget engines and parts. Catalogue 25c. Cable R. C. O., Robert M. Roof, R. & R. Mfg. Co., Anderson, Indiana, U. S. A.

GUARANTEED semi-diesel conversions for gasoline motors, $12.00. Enclose stamp for illustrated literature. Des-a-gas, 1719 Addison, Berkeley, California.

USED auto parts at half price for all cars. Century Parts Co., 1712 Lafayette Ave., St. Louis, Mo.

AVIATION

ARMY AIR CORPS gives free flying training, salary, expenses paid. Information pamphlet, how to apply, 20c. Same information, Navy Aviation training, 20c. Information on Marine Corps Aviation, 20c. All three, 40c. Used airplanes, $40 and up. Literature 10c. Continental Sales, Box 344, Dept. 23, Indianapolis, Ind.

GET INTO AVIATION. Air transport pilots get up to $7,000 per year; mechanics, $2,500. Learn at this Government approved school. Write for complete information. State age. Lincoln Flying School, 4002 Aircraft Bldg., Lincoln, Nebr.

AEROPLANES, New Production, $98.00. Easy payments. Propellers for aeroplanes, boats, sleds, wind-driven generators, $2.50 up. Send 25c for more information. Hibbs, Fort Worth, Texas.

YOUNG men interested in entering aviation under Apprentice Plan write immediately enclosing stamp. Mechanix Universal Aviation Service, Strathmore Station, Dept. C, Detroit, Mich.

BROTHER, Can You Spare a Dime? If you can, send it to me and I'll send you my Low-Priced Aviation Material Catalog. (Canada 20c.) Karl Ort, 646 W. Poplar, York, Pa.

AVIATION apprentice jobs for inexperienced workers. Complete list employers and details 20c. Airployment, Box 553, West Los Angeles, California.

HUNDREDS Airplanes, crackups, terms. Complete catalogue, 25c, postpaid. Aircraft Directory, Athens, Ohio.

BLUEPRINTS

METAL TUBE Midget Radio, the last word in compact radio receivers. You can construct this set even though your knowledge of radio is limited by following the large pictorial blueprints available, from Modern Mechanix Publ. Co., Greenwich, Conn., at 50c postpaid.

BOATS

HOW TO BUILD 20 BOATS—The big new edition contains twenty different up-to-date plans for sailboats, iceboats, rowboats, outboards, cruisers, and speedboats. The price for the book, 50 cents, makes each plan cost only 2½ cents. Order your copy from Modern Mechanix Pub. Co., Fawcett Bldg., Greenwich, Conn.

BOOKS & PERIODICALS

SPORTSMEN'S MANUAL—The outdoors man's guide containing scores of practical articles by America's leading outdoor writers, covering every phase of fishing, hunting, camping, and trapping. This book, edited by Robert Page Lincoln, will make that next vacation a dozen times more enjoyable. Price 50c at your newsstand, or order directly from Modern Mechanix Publishing Co., Fawcett Bldg., Greenwich, Conn.

BOOKS! Books! Books! Used books wanted. I'll pay cash or exchange any new books you want for your old ones. Send 25c in silver for my book catalogue Today! Levi Bryant, 654 East 44th St., Chicago, Illinois.

FREE—Send for list of new technical books at sensational discounts. B. Winn, 124 West 23 St., New York.

BURIED TREASURE

TREASURE Seekers—Learn scientific methods. Wyss, 104½ Francis, St. Joseph, Mo.

BUSINESS OPPORTUNITIES

PLASTEX Industry needs manufacturers on small scale and for big production of X-mas Tree Ornaments. Crib Sets, Art Goods, Novelties, etc., in Plastex and marble imitation. Cheaply and easily made in our guaranteed rubber moulds. We cooperate in selling goods. Since crash, low priced goods are needed and this line meets demand. Interesting booklet mailed free. Plastex Industries, 1085 Washington Ave., Dept. R, New York, N. Y.

MONEY for you making window boxes and selling supplies to all who raise plants in house. Easy, pleasant, profitable. Steady work for all or part time; can grow to large proportions if desired. Free information. C Decorative Sales, 63 Baumer, Johnstown, Pa.

MAKE Artificial marble, glossy tiles, uncanny. Tabletops, plaques, floors, whetstones, novelties. Cement secrets, hard, fireproof, inexpensive. Brilliant tile and liquid rubber samples 3c. John H. Payn, 945 Grande Vista Avenue, Los Angeles, Calif.

WE START you in business, furnishing outfits and instructions, operating "Specialty Candy Factory" home. Men and women, earn $25.00 up to $75.00 weekly, all or spare time. Booklet free. W. Hillyer Ragsdale, Inc., Drawer 110, East Orange, N. J.

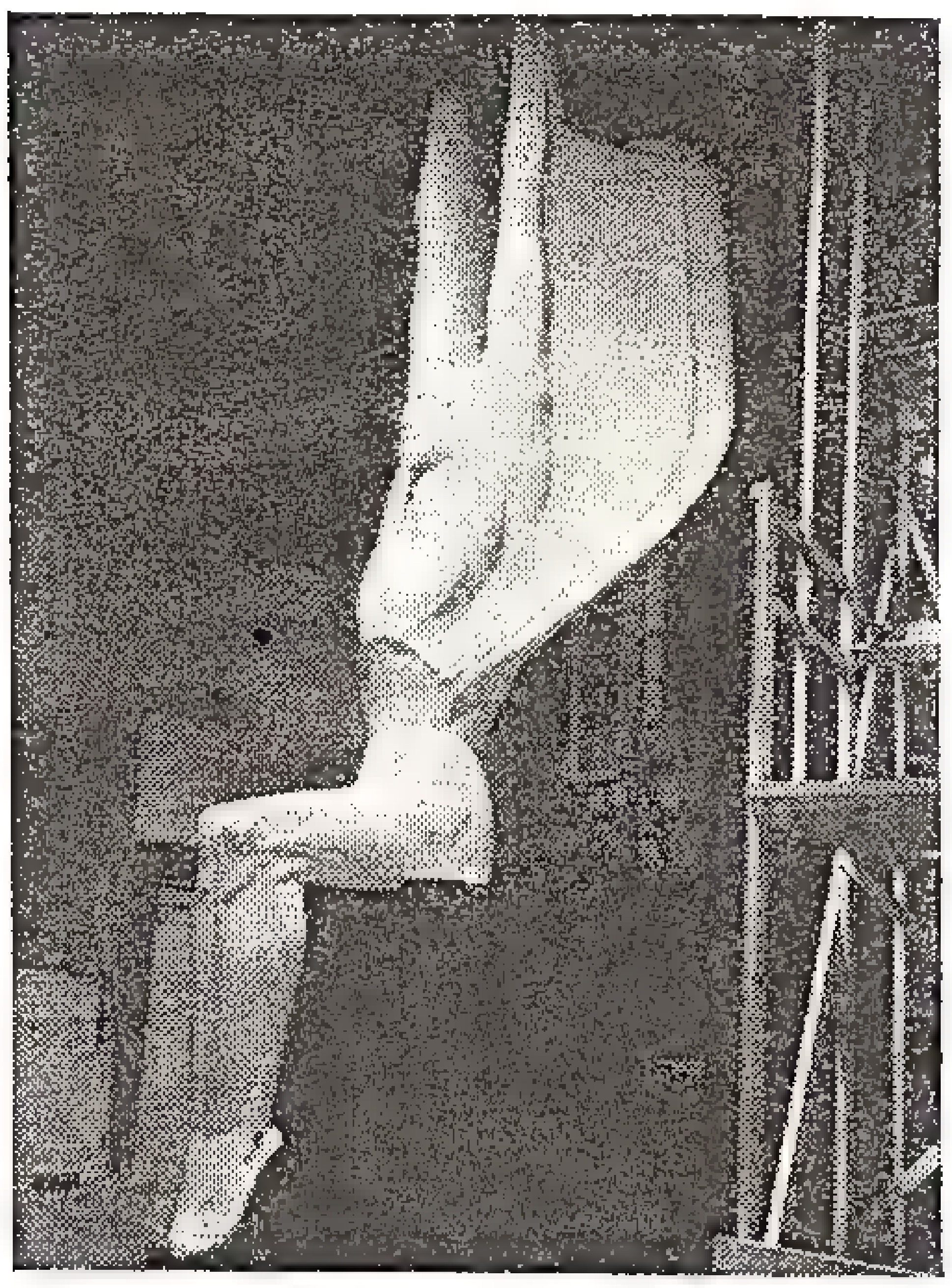
IF YOU Have Some Spare Room, a basement or garage where you can do light work, see our offer to Branch Manufacturers on page 29. Metal Cast Products Co., 1696 Boston Road, New York City.

STOP squealing, start crowing! Work mornings home, drive in country, or "movies" afternoons! Unusual plan. No canvassing! Prepare for surprise! National Folio-C (Station "D"), Los Angeles.

FREE circulars describing hundreds of money making opportunities selling by mail. Build your own business. Write now. Progress Publishing Co., Box 1936M, Milwaukee, Wis.

GET barrels of money-making mail. Your name in 10,000 Directories, 25c. Roservice, 4627 Glenshade, Cincinnati.

Giant Winged Figures Decorate Boulder Dam



This plaster winged statue will eventually be cast in bronze with a duplicate to match it. They will flank the 125-foot Boulder Dam flagpole on the Nevada side of the Colorado River. The figures will be 30-feet high.

350 SUCCESSFUL, guaranteed Money Making Secrets sent complete post paid in plain sealed wrapper for 50c. No stamps. M. L. Allen, Box A, Zillah, Washington.

THE COLLECTION BUSINESS offers profit and opportunity. Quickly learned. Sure income. Write Cole Associates, Syracuse, New York.

ANSWER mail for us. $5.00 daily possible. Postage and supplies furnished. Contract 25c—coin refundable. Vollmer's, North Bend, Oregon.

SUCCEED With Your Products. Make-Sell Them. Formulas. Processes. Accurate analyses. Catalog free. A. Thaxly Co., Washington, D. C.

CORRESPOND for newspapers. Profitable, interesting. Easily learned. Write Publishers' Service Bureau, 4258-E Drexel, Chicago, Ill.

NO BOSS! Sure Cash! Silvering Mirrors, Autoparts, Reflectors. Combination outfit. Write, Sprinkle, Plater, 845, Marion, Indiana.

AMATEUR Cartoonists may earn up to $55.00 weekly, copying cartoons for Advertisers. M-Syndicate, Argyle, Wisconsin.

MILLIONS Jobless!! Make money supplying job-getting information (stamp). P. O. Box 16, Westfield, Mass.

SIGNS. Any kind easily painted with Letter Patterns. Write for free sample. John Rahn, B1330 Central, Chicago.

SELL by Mail! Books, Novelties! Bargains! Big profits! Particulars Free! H. Elfco, 438 North Wells, Chicago.

MAIL Business. Start small. Everything furnished. Free details. Metromails, M-1, Cincinnati.

DOLLARS Daily. Operate Home Mail-order Businesses. Details. Duffy-Co., Covington, Ky.

"MASTER Mail Order Plans" are profitable. 10c. Naco, Frankford, Delaware.

MAIL ORDER Opportunities. Literature. Silvester & Co., Old Bridge, N. J.

CAMERAS & PHOTO SUPPLIES

CAMERAS and supplies. Free illustrated catalog listing everything photographic—still and movie cameras, films, lenses—at tremendous savings. Hundreds of bargains, new and used. All guaranteed. We take your old camera or equipment in trade. Write now for your Free copy of our newest money-saving Bargain Book—just out! Limited edition. Hurry! Central Camera Co. (Photographic Headquarters since 1899), 230 So. Wabash, Dept. 1-J, Chicago.

MAKE money in photography. Learn quickly at home. Spare or full time. Easy plan. Previous experience unnecessary. Common school education sufficient. Interesting booklet and requirements free. American School of Photography, 3601 Michigan Avenue, Dept. 2048, Chicago.

INCOME From your camera instead of expense. Low cost home course teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money wherever you live. Free book. Universal Photographers, Dept. A, 10 West 33rd St., New York.

BARGAINS in New Cameras. Special Discount on Kodak Films. Catalogue Free. Camera Store, Sac City, Iowa.

CARTOONING

CARTOONING, Sketching, etc.—46 lessons, 600 illustrations, including practice sheets, pens, pencils. $1.00 Complete. Fraba Service, Dept. M-2, Cashton, Wisconsin.

MAKE $25.00 weekly duplicating Advertising Cartoons. Write Paisley-M, Kinloch Bldg., St. Louis, Mo.

CHEMISTRY

SEND 25c for new illustrated chemical Experiment Book with over 300 formulas and tests. Also receive 32 page illustrated catalog of apparatus, microscopes, telescopes and chemicals free. C. Winn, 124 West 23 St., New York.

DETECTIVES

BECOME a Successful Detective. Earn Big Money—Travel. Detective Newspaper and Particulars Free. National System, 425-D, Fremont, Nebraska.

DETECTIVES—Make Secret Investigations. Experience unnecessary. Detective particulars free. Write, George Wagner, 2640-V Broadway, N. Y.

DUPLICATORS

INCREASE Business. "Excellograph" Rotary Stencil, Clay, and Film Duplicators $3.85 to $37.50. Prints anything typewritten, penned, drawn, traced. Colors. Folder Free. Pittsburgh Typewriter Supply, Suite 519, Pittsburgh, Pa.

EDUCATIONAL & INSTRUCTION

WORK for "Uncle Sam". $105-$175 month. Men-women. Many 1937 appointments. Try next held examinations. Common education usually sufficient. Qualify now. Influence unnecessary. Full particulars, list jobs and sample tests—Free. Write today sure. Franklin Institute, Dept. T64, Rochester, N. Y.

MEN Wanted—Learn Tool & Die Making. Automatic Screw Mach. Machinist Trade. Big Demand. Actual Experience. Expert Supervision. Write for Free Book "M". Allied Screw Machine Co., Inc., School Div., 603-9 Lake St., Chicago.

SIGNS. 27 Easy Picture-Way Lessons teach you popular easy lettering, layout, and color quickly. Complete instruction $2.00. Guaranteed! Stewart School, 3553 Aberdeen, Alton, Illinois.

WORK for "Uncle Sam". Start, $105-$175 month. Age 18—50. Want to qualify for next entrance test? Write, Instruction Service, Dept. 234, St. Louis, Mo.

FOREST Jobs available $125-$175 month. Cabin, hunt, trap, patrol. Qualify immediately. Write Rayson Service, B-32, Denver, Colo.

ELECTRICAL SUPPLIES

HUNDREDS of new and rare items, replacement parts and supplies. Send 10c for new, 60-page, wholesale catalog. Autopower, 412-H S. Hoyne Avenue, Chicago.

ENGINES, MOTORS, ETC.

WINDING Data, 1000 AC motors, eight leading manufacturers. $1.00. Chas. Chittenden, Jr., Box 7631, Kansas City, Missouri.

WINDING Data, 225 motors, single and three phase. Price $1.00. Motor Data Service, Box 7631, Kansas City, Mo.

FIRE ARMS

GUNSMITHS Secrets. Blueing! Checkering! Engraving, etc., 25c. Duffy-Co., Covington, Ky.

FOR INVENTORS

INVENTORS: Send immediately for your copies of our new Free books, "Patent Protection" and "Suggestions on Selling an Invention". Sixty-eight pages of interesting facts. They tell how Patent Laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send Free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 921-A, Victor Building, Washington, D. C.

INVENTORS—Small ideas may have large commercial possibilities. Write us for FREE book, "Patent Guide for the Inventor" and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien and Hyman Berman, 28-Y Adams Building, Washington, D. C.

WE Successfully Sell inventions, patented and unpatented. Write for proof, and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 5-B, Washington, D. C.

INVENTORS—Sell your inventions before patenting. Free particulars Write W. T. Greene, 942 Barrister Building, Washington, D. C.

FREE Information about new magazine for inventors who want more profit from their ideas. Write "Successful Inventions," 801 Barrister Bldg., Washington, D. C.

INVENTION Finance Magazine, 80-H Wall Street, New York. Year subscription 60c entered upon promise to pay on receipt of first copy.

GET Your Own Patents. Legal blanks, complete instructions $1. Cudding Sons, Campbell, California.

FORMULAS

SUCCEED With Your Products. Make-Sell Them. Formulas. Processes. Accurate analyses. Catalog free. A. Thaxly Co., Washington, D. C.

Eggs Fried Without Flame Over Magnet

Electro-magnetic currents produced when this young lady held an iron frying pan over two powerful magnets was sufficient to fry an egg in a few moments. After removing the pan the magnets were inactive and could be touched without danger of burning the fingers although current was on.

FORMULAS—Latest money makers. Literature free. D-Belfort, 4042 N. Keeler, Chicago.

9,000 FAMOUS Formulas $3.00, 3,000 $1.00. 600—25c. Voxco, B-933-X, Denver.

FORMULAS—All kinds. Guaranteed Catalog Free. Kemico, 67, Parkridge Illinois.

20 SECRET Money Making Specialty Formulas, 25c. Duffy-Co., Covington, Ky.

FROG RAISING

"RAISE Giant Frogs"! We buy! Start backyard. Frogs sell up to $5 dozen. Free book. American Frog Canning Company (142-X), New Orleans, La.

HELP WANTED—INSTRUCTION

BECOME a Business Detective—make money in your spare time—pleasant work—good fees. Details Free. Business Detective System, 1009 Oak Street, Elmira, N. Y.

HYPNOTISM

HYPNOTIZE Instantaneously! Learn how! Instructions 25c. Lonk Institute Hypnotism, D-1313, Palatine, Illinois.

HYPNOTIZE Instantaneously — Control Others. $25.00 Guaranteed Course $1. DeSala, Buechel, Ky.

INSTRUCTION

BE A RADIO EXPERT—Many Make $30, $50, $75 a week. Learn at home in spare time. Radio's big growth making many good full time and spare time jobs. Write for Free copy of 64-page Book. National Radio Institute, Dept. 7AHA, Washington, D. C.

INVENTIONS

HAVE you a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 5-A, Washington, D. C.

INVENTIONS WANTED

SKILL and Science: Have you an idea for a new game of skill or science for either public or homse use? We will buy outright or finance marketing of meritorious presentation. No gambling devices. Will H. Wade & Co. (Investment Bankers), 134 So. LaSalle, Chicago.

SMALL inventions wanted by manufacturers. I'll help you sell your invention. S. Hull, 7829 Euclid Avenue, Cleveland, Ohio.

INVENTIONS Commercialized. Patented or unpatented. Write Adam Fisher Company, 582 Enright, St. Louis, Mo.

MACHINERY FOR SALE

RELIANCE Electric Pipe Thawing Machine — price $39.25, complete! Thaws out frozen pipes in 1 minute. Gold mine this winter! Write! Commonwealth, Dept. P-709, Cincinnati, Ohio.

MAGIC TRICKS & NOVELTIES

MAGIC TRICKS, Joke Novelties, Puzzles, at lower prices. South's largest line. My famous Catalogue, "Book 1,000 Wonders" and "50 Mysteries Magic" postpaid 10c. Write today! You will be surprised! Lyle Douglas, Station A-14, Dallas, Texas.

SOMETHING novel in ashtrays. Rich appearance, durable, an ideal gift. Black, brown, or gold. 35c each, 3 for $1. Delaco, 6 East 15, Wilmington, Del.

MYSTIFY Your Friends—be a mind reader! Amazingly clever trick and catalog sent for 10c. National Magicians, 5712-G Woodlawn, Chicago.

LEARN MAGIC — Large Illustrated Catalog of tricks. You Can Do. 25c. Holden, 222 West 42nd St., New York.

"DON'T Miss This," 15 good tricks 15c. C. A. Hyde, 537 Ritter St., Reading, Pa.

MALE HELP—AGENTS

625,000 ARTICLES for sale cheap. List 10c. Duffy-Co., Covington, Ky.

MALE HELP WANTED

LOCAL AGENTS Wanted to Wear and demonstrate Free Suits to friends. No canvassing. Up to $12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples Free. H. J. Graves. Pres., 1300 Harrison, Dept. N-819, Chicago.

MALE & FEMALE HELP WANTED

MRS. M. earned $267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book Free. United, 3848-A89 Lincoln Ave., Chicago.

MALE INSTRUCTION

DETECTIVES. Work home or travel. Experience unnecessary. Write, American Detective Institute, 2640-T Broadway, N. Y.

MIDGET AUTOMOBILES

BUILD a Midget Miller Racer. Complete plans for constructing this authentic midget automobile appear in the new 1936 edition of How-To-Build-It along with many other interesting home and workshop plans. Send 50c for the 148-page book to Modern Mechanix Publ. Co., Greenwich, Conn.

MISCELLANEOUS

SPORTSMEN! Here's how to get the most out of your fishing, camping, and hunting trips. Follow the advice of America's outstanding outdoor writers; men who know and who have brought their years of research to you within the pages of the Sportsmen's Manual, 146 pages of unusual outdoor photographs, plans and suggestions. Printed, throughout, in rotogravure. Send 50c for your copy. Modern Mechanix Publ. Co., Greenwich, Conn.

IF YOU ARE looking for a representative in the Far-East, apply with full particulars to United Agencies, 244 Route Maresca, Shanghai, China.

RECEIVE Gigantic Mails, magazines, samples. Your name in 1,000 mailing lists—10c. Fairbanks Centerpoint, 100 Forsyth, New York.

DO YOU like Baseball? A game that's a hit. Manage your favorite team. Details ten cents coin. Jim Jordan, Stafford, Kansas.

REBUILT Standard Size and New Portable Typewriters at bargain prices. Write for prices. Hoyt's Store, Sac City, Iowa.

TRIANGLE Chart solves triangles by inspection. Faster than Trigonometry. 20c (coins). P. O. Box 764, Detroit, Mich.

MEXICAN Curios, Christmas Novelty. Particulars Free. Samples 10c stamps. Apartado 1176, Mexico City, Mexico.

BURIED Treasure Minerals, free booklet, photographs. Fisher, Palmer Bldg., Hollywood.

MODEL RAILROADING

BUILD a Model Railroad in 00 gauge (¾ inch between rails). A complete catalogue of parts, construction kits, and completed units. One Dime. Nason Railways, P. O. Box 9, Mt. Vernon, N. Y., Dept. X1.

MODELS & MODEL SUPPLIES

A PENCIL-LENGTH model locomotive, authentic in every detail! Table top railroading is no longer the model-makers dream. Anyone with the slightest mechanical ability can construct this electrically operated locomotive and tender by following the detailed plans appearing in the 1936 Edition of How-To-Build-It. Send 50c for your copy, now! Modern Mechanix Publ. Co., Greenwich, Conn.

YOUR Ideas developed into practical working model. 30 years successful experience; thousands satisfied customers. Confidential service guaranteed. Bank references. Send 3c postage for 32 page book "Making Inventions Pay." Crescent Tool Company, Dept. T. Cincinnati, Ohio.

MODEL railroad builders' supplies, also kits. "O" gauge, quarter inch scale. Freight car kits, $1.00. Loco kits, new low prices. Send 10c stamps for catalog SM. A. J. Volk, Montclair, New Jersey.

BUILD a Model Railroad, the most fascinating hobby in the world. 24 page catalog 10c. Mention Modern Mechanix. Model Railroad Shop, Dunellen, New Jersey.

Spark Plugs Designed For Model Plane Use

Here is a miniature spark plug that all model fans will welcome since it is just like the standard size product in appearance and results. Designed by a leading manufacturer the tiny device will fire any model gasoline engine, whether it is for boat or airplane use.

FREE: Illustrated circular. Listing 40 engines. Locomotive castings. Supplies. Stamp required. Emco, 2417 N. Ashland, Chicago.

ALUMINUM castings made to order. Lowest prices. H. Moore, Sutton Rd., Millbury, Mass.

MONEY MAKING OPPORTUNITIES

NEW, Original Money Maker. Guaranteed to work. Details 25c. M. Williams, 504 Marion, Bellefonte, Del.

MOTION PICTURE & SOUND EQUIPMENT

GET our Bargaingram chuck full of real buys in Candid, Movie Cameras, films, projectors, screens; Silent-Sound 16MM film library. Brand new 8MM Movie Camera $9.95. Motor Projector $12.50. Trades accepted, bought. Mogull's, 1944-M Boston Road, N. Y.

LEARN Motion Picture Theatre Business. Home-study training: Management, Advertising, Projection. Free Catalog. Theatre Institute, 345 Washington, Elmira, N. Y.

MOTORCYCLES

SEND 15c FOR ILLUSTRATED used Motorcycle catalog. Bargains. Largest stock genuine Indian parts and motorcycles. Indian Motorcycle Sales, Kansas City, Mo.

RECONDITIONED Motorcycles. New and used parts for all makes. Complete service. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

ALLOY Pistons. Harley, Henderson, Indian, Excelsior. Used parts, catalogue and wings pin 10c. Ballak, 1115 Chestnut St., St. Louis, Mo.

MUSHROOM GROWING

MONEY IN MUSHROOMS! Start now, in cellar or shed, get highest prices. Exclusive new process. Bigger, better, quicker crops. We buy. Book free. American Mushroom Industries, Dept. 801, Toronto, Ont.

OFFICE EQUIPMENT

TYPEWRITERS, multigraphs, addressing machines, adders, dictaphones, duplicators, sealers, folders. Save half, write Pruitt, 553 Pruitt Bldg., Chicago.

OLD GOLD WANTED

CASH for old gold, teeth, watches, jewelry. 100% full cash value mailed day shipment received. Satisfaction guaranteed or articles cheerfully returned. Information free. Chicago Gold Smelting Company, 300-C Champlain Building, Chicago.

OLD MONEY WANTED

$5.00 to $500.00 EACH paid for Old Coins. Keep all old money. Get posted. Send 10 cents for Illustrated Coin Value Book, 4x6. Guaranteed Buying and Selling Prices. Coin Exchange, Box 18, Le Roy, N. Y.

PATENT ATTORNEYS

INVENTORS: Send immediately for your copies of our new Free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how Patent Laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send Free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 920-A Victor Building, Washington, D. C.

INVENTORS—Small ideas may have large commercial possibilities. Write us for FREE book, "Patent Guide for the Inventor" and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien and Hyman Berman, 28-Y Adams Building, Washington, D. C.

UNPATENTED Ideas Can Be Sold. We tell you how and help you make the sale. Particulars, with list of manufacturers and wanted inventions, sent free on request. Write W. T. Greene, 958 Barrister Bldg., Washington, D. C.

"INVENTOR'S Guidebook" containing 96 mechanical movements and advice about patenting, selling inventions, also "Record of Invention", Free. Frank A. Ledermann, Patent Attorney-Engineer, 154 Nassau Street, New York.

PATENTS

PATENT Your Idea—Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, thirty-seven years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 925-A Victor Building, Washington, D. C.

INVENTORS—Small ideas may have large commercial possibilities. Write us for FREE book, "Patent Guide for the Inventor" and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien and Hyman Berman, 28-Y Adams Building, Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Reasonable fees. Watson E. Coleman, Victor Building, Washington, D. C.

INVENTIONS Wanted—Patented, unpatented. If you have an idea for sale, write Hartley's Inc., Box 928-J, Bangor, Maine.

OBTAIN Patents, 23 Lessons, $1.00. Free Lesson. Enclose Stamp. Instructor, 25 South Pearl, Youngstown, Ohio.

PATENTS—Reasonable Terms. Book and advice free. L. F. Randolph, Dept. 341, Washington, D. C.

PATENTS WANTED

INVENTIONS Commercialized. Patented or unpatented. Write Adam Fisher Company, 582 Enright, St. Louis, Mo.

PERSONAL

STUTTERING and Stammering corrected at home. Booklet free. Paul J. Wolfe, Box 52, Pittsburgh, Penna.

PHOTO DEVELOPING

DEVELOP and print your own pictures. Save time, money with our complete $1.49 outfit postpaid, or pay post man $1.55 COD. Includes electric ruby lamp, printing frame, photo paper, chemicals and equipment. One of hundreds of amazing bargains in our Free, newest, money-saving Bargain Book. Send for it today! Central Camera Co., 230 So. Wabash, Dept. 21-J, Chicago.

FINER Finishing. Rolls developed and printed, with One Colored enlargement, or two professional enlargements. All for 25c (coin). Genuine, Nationally Known, Moentone Superior Quality. Moen Photo Service, La Crosse, Wis.

FILMS Developed. 25c coin, 2 5x7 Double Weight Professional Enlargements, 8 Gloss Prints. Club Photo Service, LaCrosse, Wis.

ENLARGEMENTS. 8x10 Double-weights, 25c. Cardinal Photo, Berkley Hights, N. J.

FILMS finished 15c. 116 and larger 20c. Photo Service, 644 Genesee Ave., Morrison, Ill.

POCKET RADIOS

FREE "Pocket Radio". Particulars, catalogue, 10c. American Business Service, Shamokin, Pennsylvania.

POULTRY

POULTRY TRIBUNE — America's leading poultry magazine. Five years $1.00; one year trial 25c. Poultry Tribune, Dept. 92-C, Mount Morris, Illinois.

AS WORLD'S Largest Chick Producers, we can save you money. Big Catalog Free. Colonial Poultry Farms, Box 446, Pleasant Hill, Mo.

PRINTING

PRINT your own cards, stationery, circulars, advertising, etc. Save money. Easy rules furnished. Print for others. big profits. Junior press, $5.90; job presses, $11; power, $149. Write for details. Kelsey Co., S-57, Meriden, Conn.

PRINT 250 envelopes, letterheads, business cards, or statements—$1.00 postpaid. Globe, Pottstown, Penna.

DISTINCTIVE Printing—Free samples. Jackson Co., Harding St., Fall River, Mass.

250 BOND letterheads or envelopes $1.00. Woods Press, Bedford, Penna.

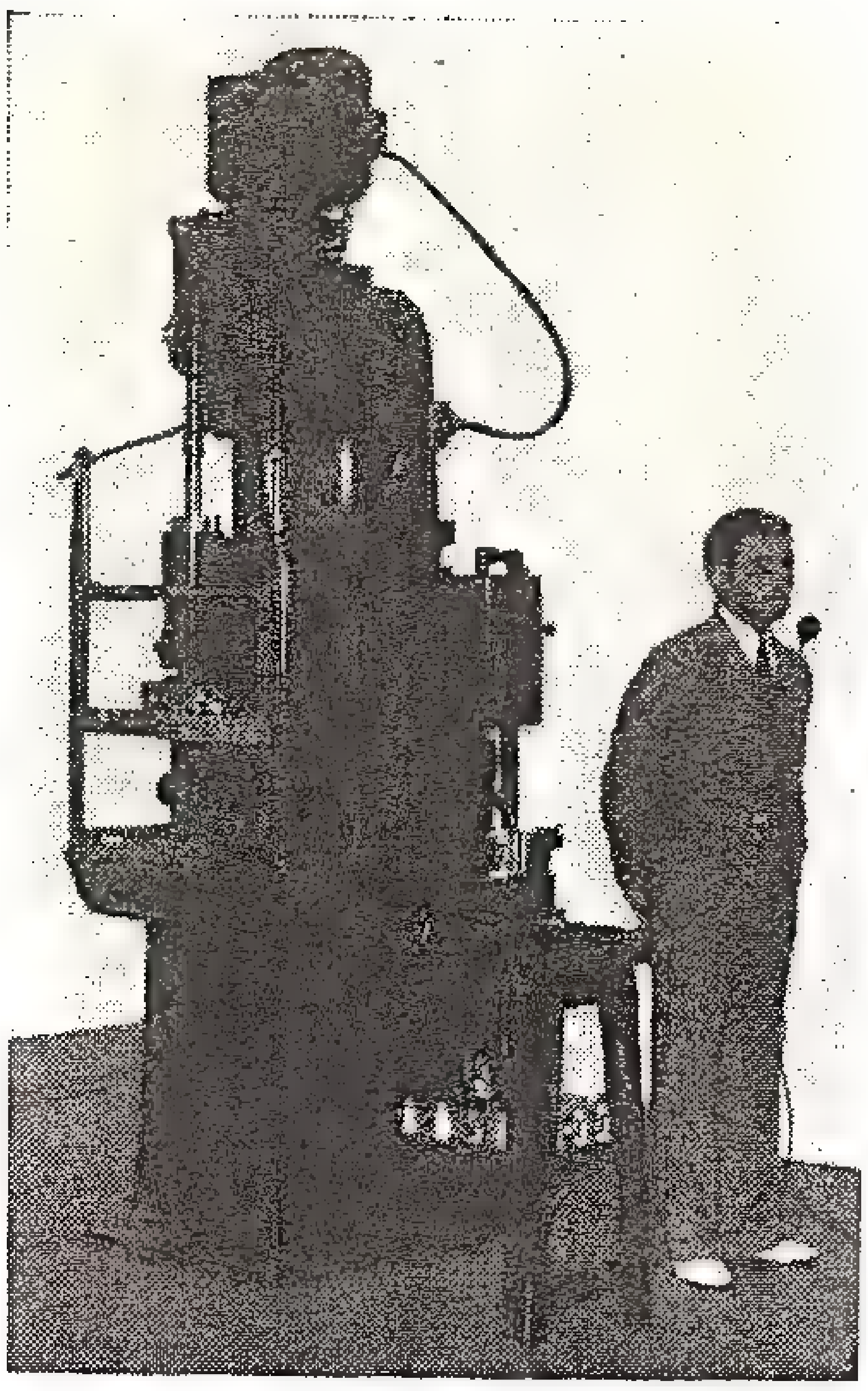
PROPELLERS

PROPELLERS, Sled, Lightplane, lowest prices, literature 6c. Woodcraft Propeller Co., Hillside Station, Wichita, Kans.

RADIO & TELEGRAPHY

CRYSTAL Set—4,250 mile record. Blueprint 18 Distance Models with "Radiobuilder" year—25c. Laboratories, 151-K Liberty, San Francisco.

Instrument Measures Two Millionth Of Inch



Capable of measuring to two-millionth of one inch this instrument, known as a Johansson gauge, is used in manufacturing precision automobile parts. Errors 1500 times smaller than a hair can be detected by this vernier gauge.

RADIO BUILDERS' MANUAL—A book of radio set building plans and kinks for the home experimenter. Everything from a crystal set to a powerful 6-tube auto radio is included. Price 50 cents—order directly from Modern Mechanix Publishing Co., Fawcett Bldg., Greenwich, Conn.

RADIO Engineering, broadcasting, aviation and police radio, Servicing, Marine and Morse Telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, King St., Valparaiso. Ind.

MATCH Box Pocket Size Crystal Radio. Amazing Reception, Complete 50 Cents (Coin). Sampeitro's Shop, 104½ Balbo Avenue, Providence, R. I.

4 TUBE $8. Ballard's Radio Co., Sapulpa, Okla.

SALESMEN WANTED

MANUFACTURE and Sell Your Own Motor Overhaul Compound-Expanding Mineral Supplied. Make as easy as a cup of coffee. Clean up with world's fastest selling Specialty; Formula and enough Mineral to start business One Dollar. Xrelite Mines, Kalispell, Montana.

NEW Drycleaning Clothes Brush. Revolutionary invention. Cleans clothes like magic. Homes, offices buy instantly. Phenomenal profits. Outfit Free. Kristee, Dept. 262, Akron, Ohio.

GOLD Reflecting Letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941-G Halsted, Chicago.

SELL Men's Neckwear—regular $1 sellers cost you $3 Doz. New Fall Line. P. Zehnder, 497 S. Main St., Phillipsburg, N. J.

SIGN PAINTING

SIGN Painting taught by successful sign painter. Send dime for literature and terms. James Meagher, 71 Dunham St., Norwich, Conn.

SPECTROSCOPES

SPECTROSCOPE with book of 120 experiments, $2.50. Cudding Sons, Campbell, California.

TATTOOING SUPPLIES

TATTOOING Outfits, Supplies—Catalogue. Guaranteed Remover. "Waters," M-965 Putnam, Detroit.

TAXIDERMY SUPPLIES

FREE Official Catalogue. Big values. Eyes. Head forms. Everything, direct from manufacturer. Taxidermic Manufacturers, Memphis, Tenn.

STEER Horns seven feet spread for sale. Lee Bertillion, Mineola, Texas.

TELESCOPES, MICROSCOPES, ETC.

GET our lowest prices on Telescopes, Microscopes, Movie Cameras and hundreds of other items. Catalog free. D. Winn, 124 W. 23 St., New York.

TELESCOPES, Microscopes, Binoculars. Lowest prices. Optical catalog free. Brownscope Company, 234 Fifth Avenue, New York.

BUILD your own Reflecting Telescope. Copy of instructions ten cents. Catalog Free. Optical Laboratories, Larchmont, New York.

BUILD 6" Reflecting Telescope. All optical parts, with silvered mirror and machined castings. C. Lutts, Norwalk, Ohio.

FREE! Bargain Catalog. Telescopes, Microscopes, Binoculars. Teeko (1515-K) Evanston, Illinois.

FREE literature. Amateur Telescope Makers Supply Co., 24 West 20 Street, New York, N. Y.

VENTRILOQUISTS

LEARN Ventriloquism by mail; small cost, 3c stamp brings particulars. Geo. W. Smith, 125 North Jefferson, Room S-656, Peoria, Ill.

WELDING

DODGE Arc-Welders! Install heavy duty brushes. Guaranteed to satisfy and increase output of any kind of Dodge Arc-Welder. Brushes 50c each postpaid. Welders' Club of America, 3432 Drake, Chicago.

NEW and used Acetylene and Electric arc welding equipment at special low prices. Write Alex Adastik, 1299 Michigan, Grand Rapids, Mich.

DODGE Arc-Welder, 25-200 amperes. Build it yourself. Certified Plans $1.00. Welders' Club of America, 3432 Drake, Chicago.

ARC-WELDING Outfit $1.25. Weld fenders, braze, solder. Lavrow, 4368-W, Warren, Detroit. Stamp appreciated.

WIND ELECTRIC LIGHTS

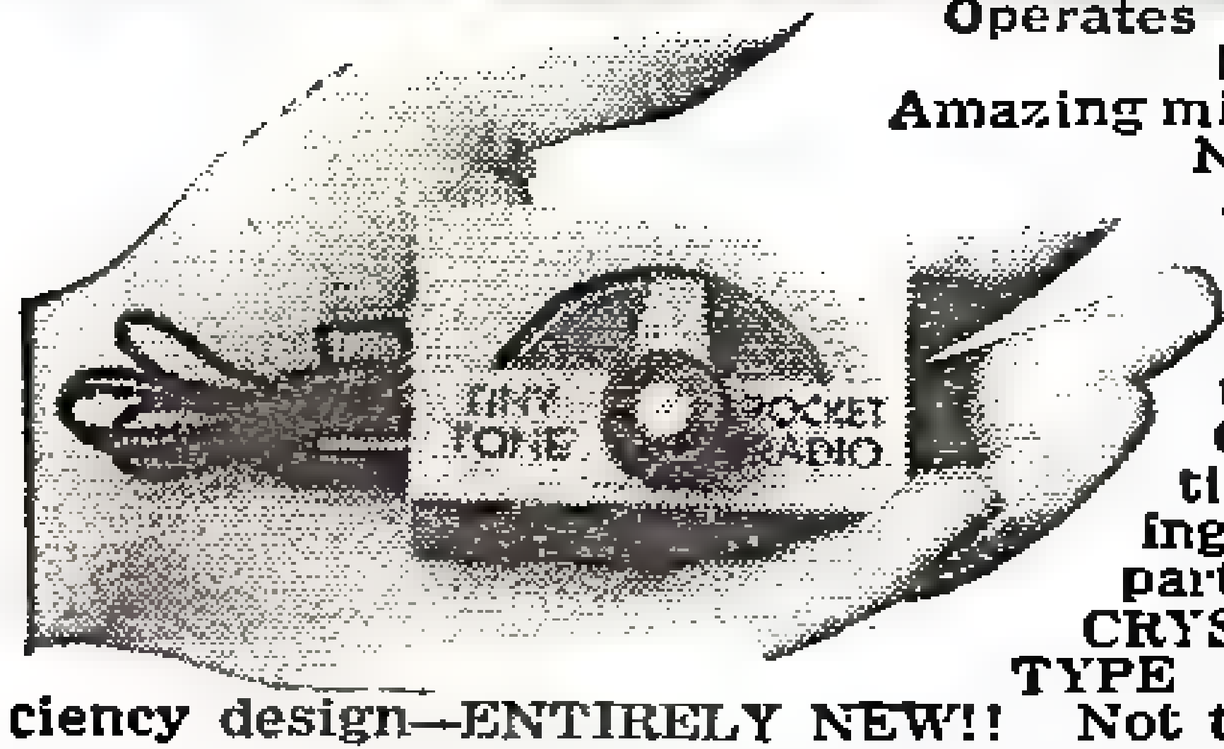
ELECTRIC Light-Wind Driven, automatic control, build your own electric plant. Copyrighted Blueprints. Write Wind Motor Electric, Brainerd, Minnesota.

WIND ELECTRIC PLANTS

GENERATOR Propellers, expertly designed at factory prices. Hibbs, Fort Worth, Texas.

WOOD CARVING

"MODERN Wood Sculpture," complete instruction book on carving Statues $1.00. Lee, Wood Art Studio, Dept. 3, Centerville, Ia.



New! Pocket Radio

Operates Without Tubes, Batteries or Electric Connections

Amazing midget radio fits in pocket or purse. NEW MODEL weighs only 2 ozs. as shown in ACTUAL photo! Smaller than a cigarette package! Separates and receives all stations with beautiful clear tone. Range to 50 miles—MUCH GREATER under good conditions—no static or noise! Nothing to wear out—only one moving part—will last for years. NO CRYSTALS to adjust. Has NEW TYPE sensitive rectifier and hi-efficiency design—ENTIRELY NEW!! Not to be confused with cheap imitations. Tunes broadcast band and POLICE and AIRPLANE CALLS! NOT A TOY, but an unusual practical radio—a sensation everywhere—a delight to anyone everyway. Comes in several beautiful colors (state yours). ABSOLUTELY COMPLETE ready to listen with midget phone and instructions to use in hotels, offices, autos, trains, camps, at home, in bed, on bicycles, at sea or wherever you may be. TAKES ONLY A SECOND TO CONNECT—no messy hookups. THOUSANDS OF SATISFIED OWNERS—many report wonderful service in ALL PARTS OF THE WORLD! THESE ARE FACTS! Carry one with you always and be assured of many hours of entertainment AT NO COST! Can be used by ANYONE—even a child! Send only $1.00—pay postman balance or send $2.99 (M. O., Cash, Check). WE PAY POSTAGE. GUARANTEED. A most unusual value. Foreign orders 75c extra.

SEND ONLY $1.00

TINYTONE RADIO CO., M-1, Kearney, Nebr.

BUILD YOUR OWN RADIO

Radio Builders' Manual contains 148 pages of instructions for constructing all-wave receivers, short-wave converters, automobile radio, and many other radio devices. Send 50c for your copy.

MODERN MECHANIX PUBLISHING CO.
GREENWICH, CONN.

WHIZ Electric Tool

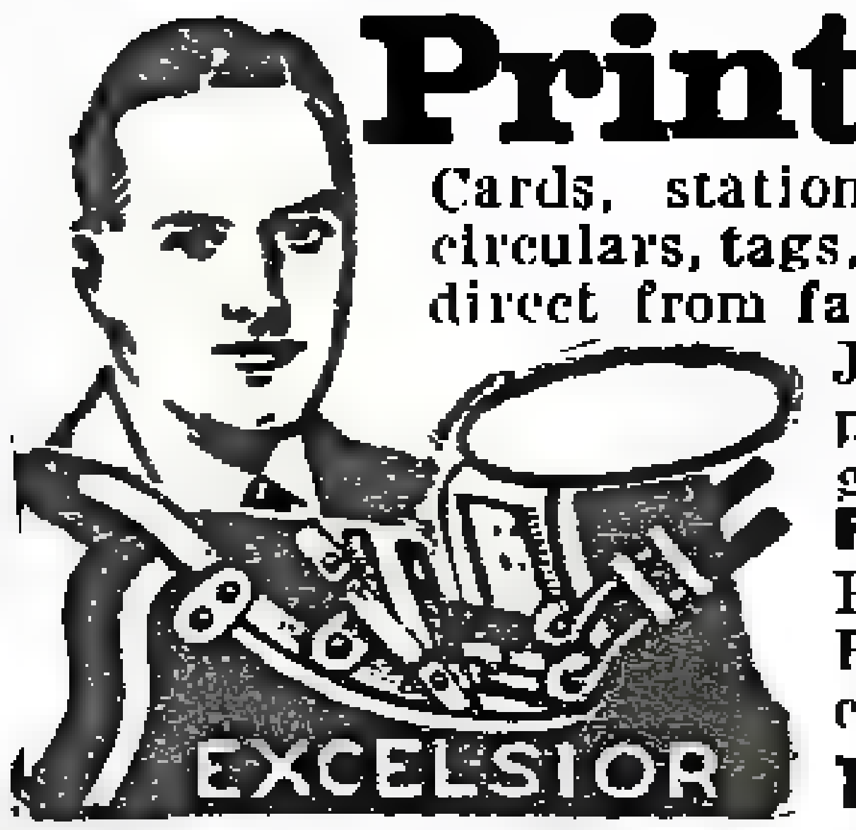
Does a real professional job of drilling, grinding, polishing, carving, routing, sanding, etc. ONLY $5.95

Powerful—Speedy—Dependable

Speeds up hundreds of jobs for shop and home. Needed by every craftsman, mechanic and carpenter. Full size chuck, ¼" capacity, geared to extra powerful motor. Self-enclosed fan prevents overheating. Ball bearing thrust. Pistol grip with thumb switch. Universal motor for A. C. and D. C. Money-back guarantee.

FREE—set of sanding discs, mandrel and drills with each WHIZ tool. Complete outfit, postpaid, at the low price of only $5.95. Order now.

Paramount Products Co., Dept. 2B, 245 B'way, N. Y.



Print Your Own

Cards, stationery, advertising, labels, paper, circulars, tags, etc. Save money and time. Sold direct from factory only. **Junior Press, $5.90.** Job Press, $11, Power, $149. Do popular raised printing like engraving with any of our presses. **Print for Others. Big Profits** Pays for itself in a short time. Easy rules sent. Write for free catalog of outfits and all details.

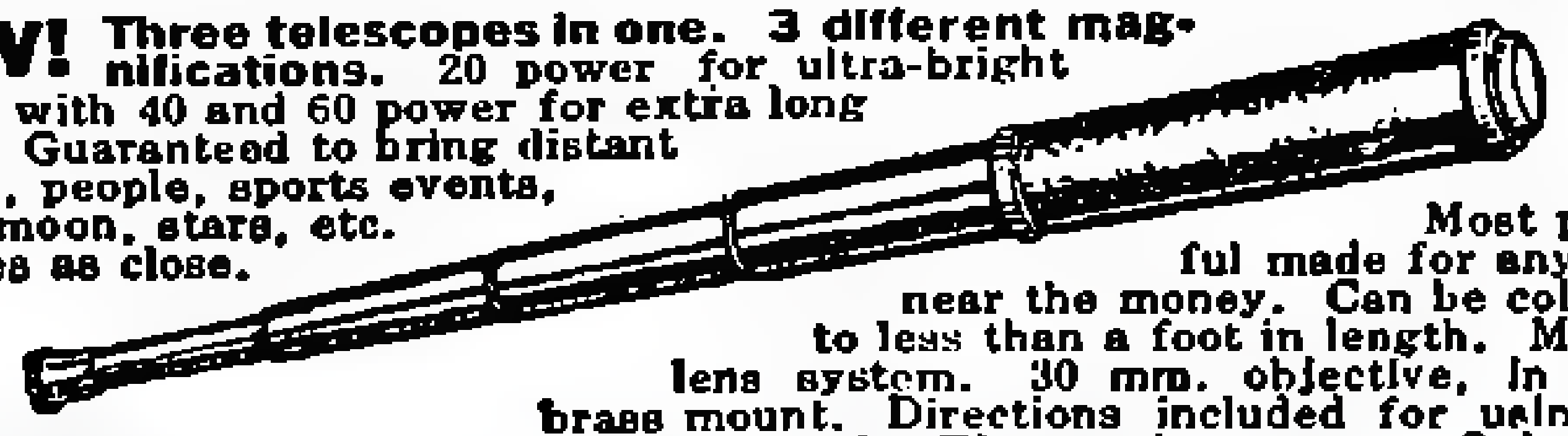
The Kelsey Co. K9, Meriden, Conn.

Train *for a* Well-Paid Hotel Position in 4 months

COME to WASHINGTON

Good positions for trained men and women in hotel, club, restaurant and institutional field. Previous experience proved unnecessary. Qualify in FOUR MONTHS—learn on real hotel equipment, under expert instructors. National Placement Service FREE of extra charge. New Day Classes start Jan., Feb., Sept., Oct. Catalog FREE!

LEWIS HOTEL TRAINING SCHOOLS
Division RPA-9134 Washington, D. C.


60 POWER TELESCOPE $2.29

VARIABLE EYEPIECE. 20X—40X—60X

NEW! Three telescopes in one. 3 different magnifications. 20 power for ultra-bright images with 40 and 60 power for extra long range. Guaranteed to bring distant objects, people, sports events, ships, moon, stars, etc. 60 times as close.

Most powerful made for anywhere near the money. Can be collapsed to less than a foot in length. Multiple lens system. 30 mm. objective, in heavy brass mount. Directions included for using as a compound 4 lens microscope. American made. We pay the postage. Only $2.29.

BROWNSCOPE CO., Dept. 71, 234 Fifth Ave., New York, N. Y.

New Ideas now Salable Before Patenting

Practical, useful inventions may now be safely marketed without patenting expense. Write for proof that we successfully sell both patented and unpatented inventions.

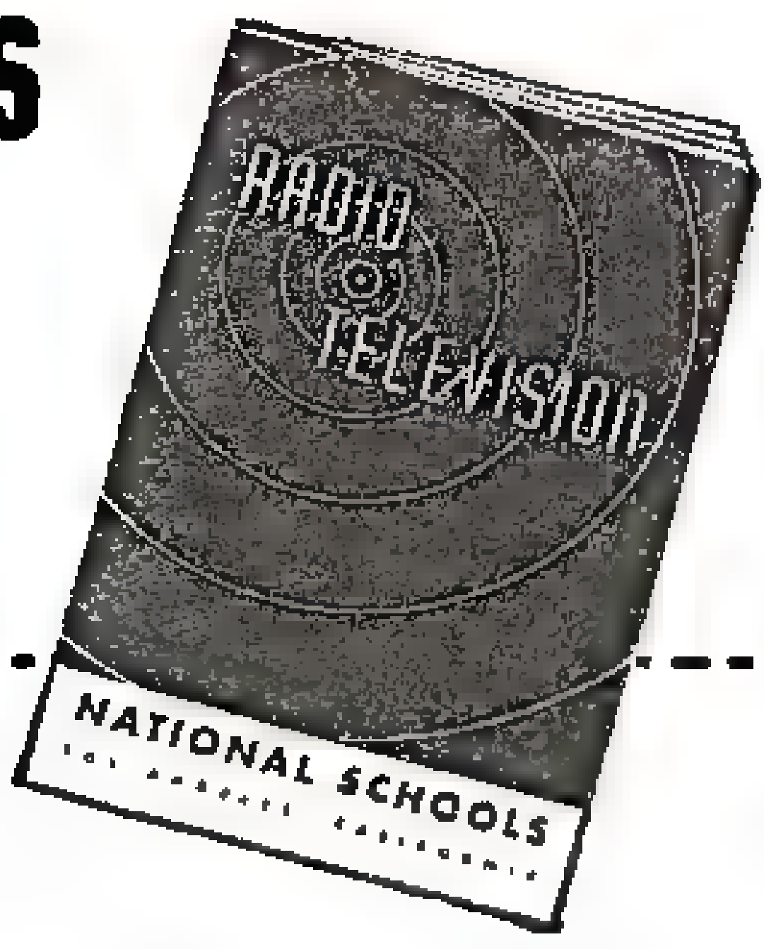
Chartered Institute of American Inventors
Dept. 5, Barrister Building, Washington, D.C.

Learn in Los Angeles

TALKING PICTURE PROJECTION
SOUND RECORDING
TELEVISION-RADIO

QUALIFY FOR GOOD JOBS

Learn the best-paying technical trades by most modern training methods right in the heart of filmdom—LOS ANGELES. National Schools is the oldest, largest trade school in West—30,000 graduates. Latest equipment. Complete instruction in Talking Picture operation, Radio Transcription, Recording, Broadcasting, Television and complete Radio training.



NATIONAL SCHOOLS

Unlimited opportunities for properly-trained men. Earn room and board while learning. Coach R. R. fare allowed to L. A.

Send for Free Book

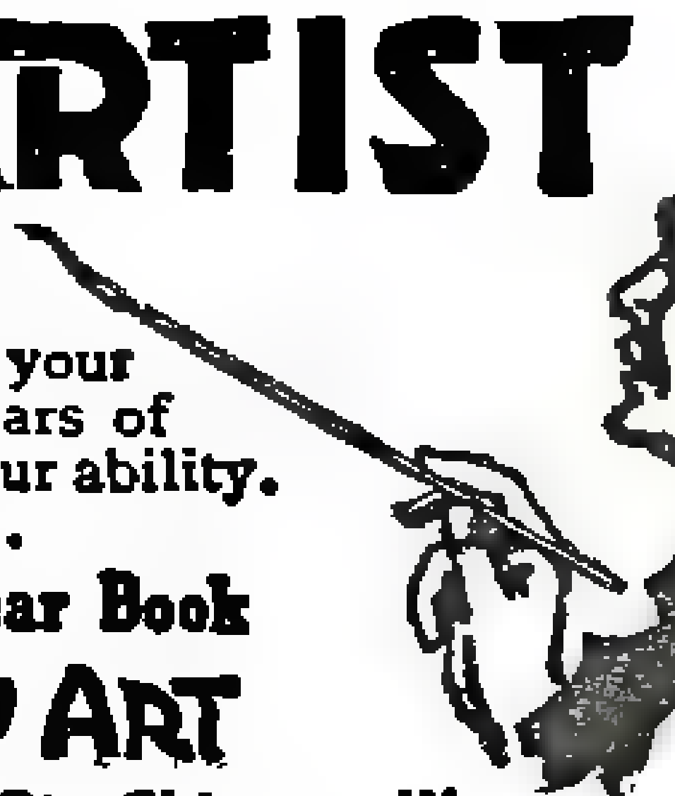
REQUEST FOR BOOK

NATIONAL SCHOOLS
Dept. I-MMR, 4000 So. Figueroa St.,
Los Angeles, Calif.

NAME ....AGE ....

ADDRESS ....

CITY ....STATE ....

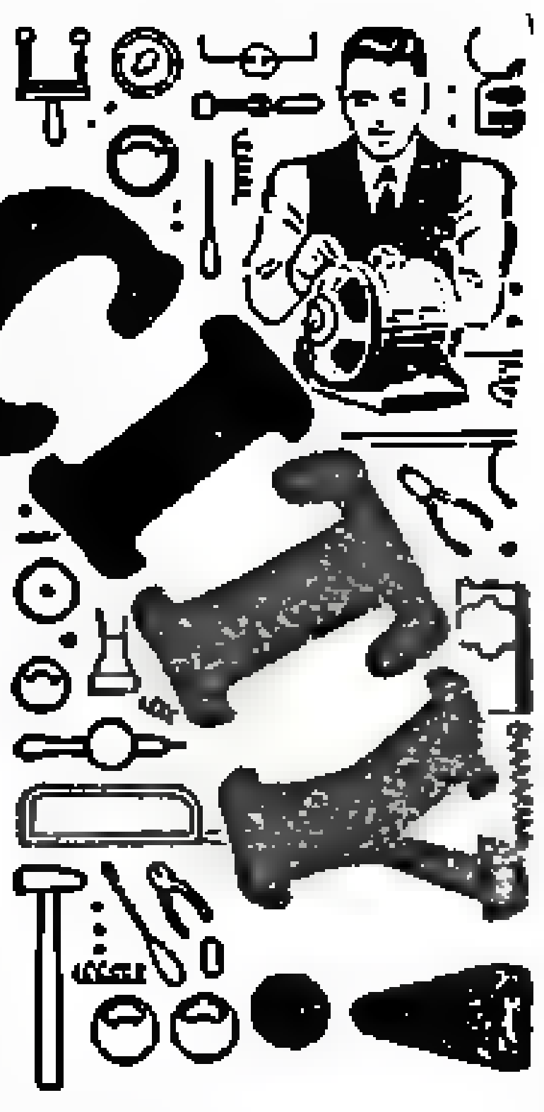

BE AN ARTIST

WE CAN TEACH YOU DRAWING in your own home during your spare time. Thirty-five years of successful teaching proves our ability. Artists receive large salaries.

Write today for Art Year Book

SCHOOL OF APPLIED ART
Dept. 617, 10 E. Huron St., Chicago, Ill.

FREE Squab Book for 1937. (Send 3-ct. U. S. stamp for mailing expense.) Quick cash for these ROYAL baby birds; orders waiting for hundreds of thousands from the largest, most reliable N. Y., Chicago and other city marketmen whose names we give you. Breed them; Sold only 25 days old. We ship breeders everywhere. See any bank about our responsibility. Write PR Company, 602 H. St., Melrose, Massachusetts, and get going on this job.



ELECTRICITY!

RADIO··REFRIGERATION··
DIESEL ELECTRIC POWER

***Learn Quickly*-in Spare Time at Home -by Practical Shop Methods**

New easy way to prepare for jobs leading to salaries of $30, $40, $50 a week. Opportunities to earn $5—$10 a week and more while training. Learn by doing actual jobs in your own home electrical shop. Electrical Equipment and Apparatus supplied at no extra cost to make training practical. No previous experience or advanced education necessary. Money back if not satisfied. Write for FREE BOOK of Facts and Opportunities for you as a trained Electrical Man.

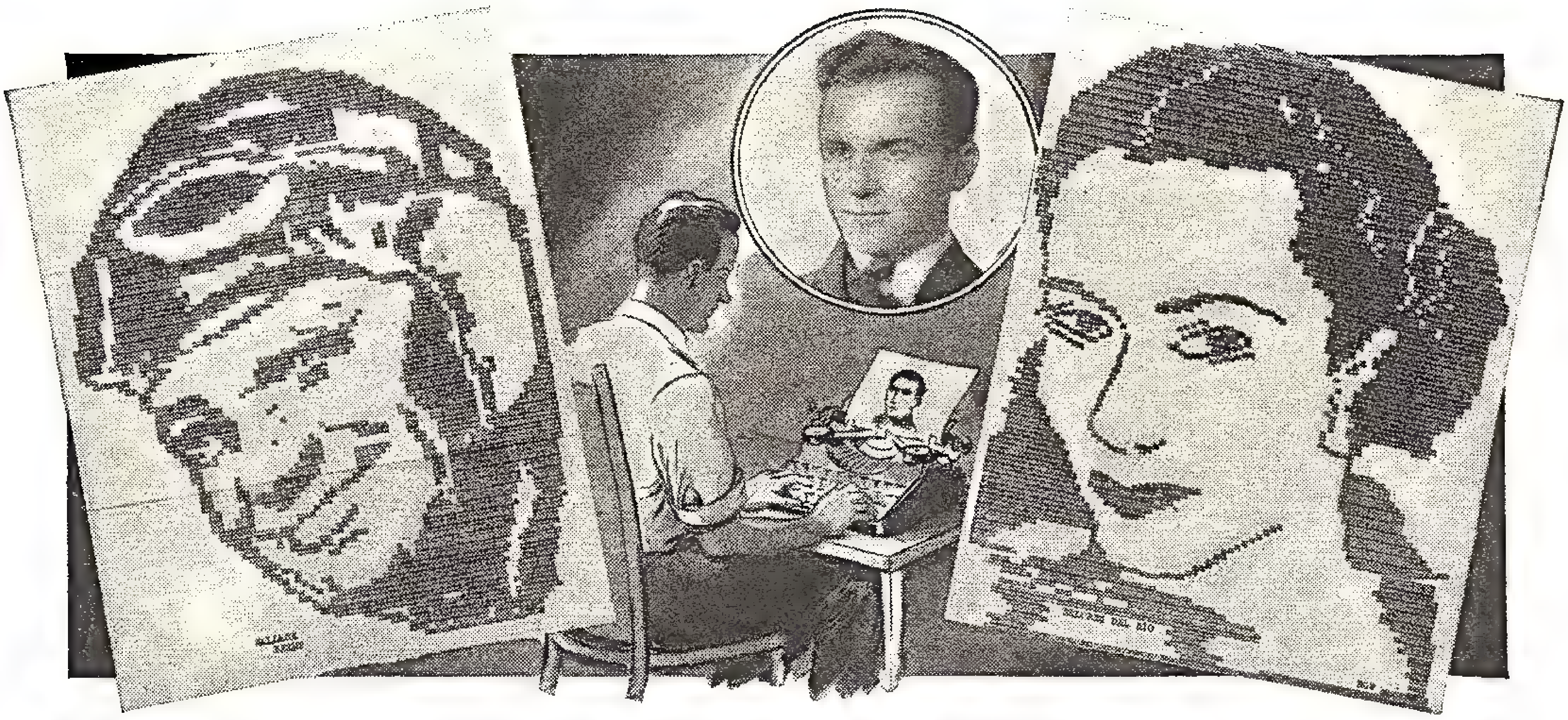
ELECTRIC INSTITUTE **H. W. PETERSEN, President**
Dept. 47-A **Hinsdale, Illinois**

NAME__________________________AGE________

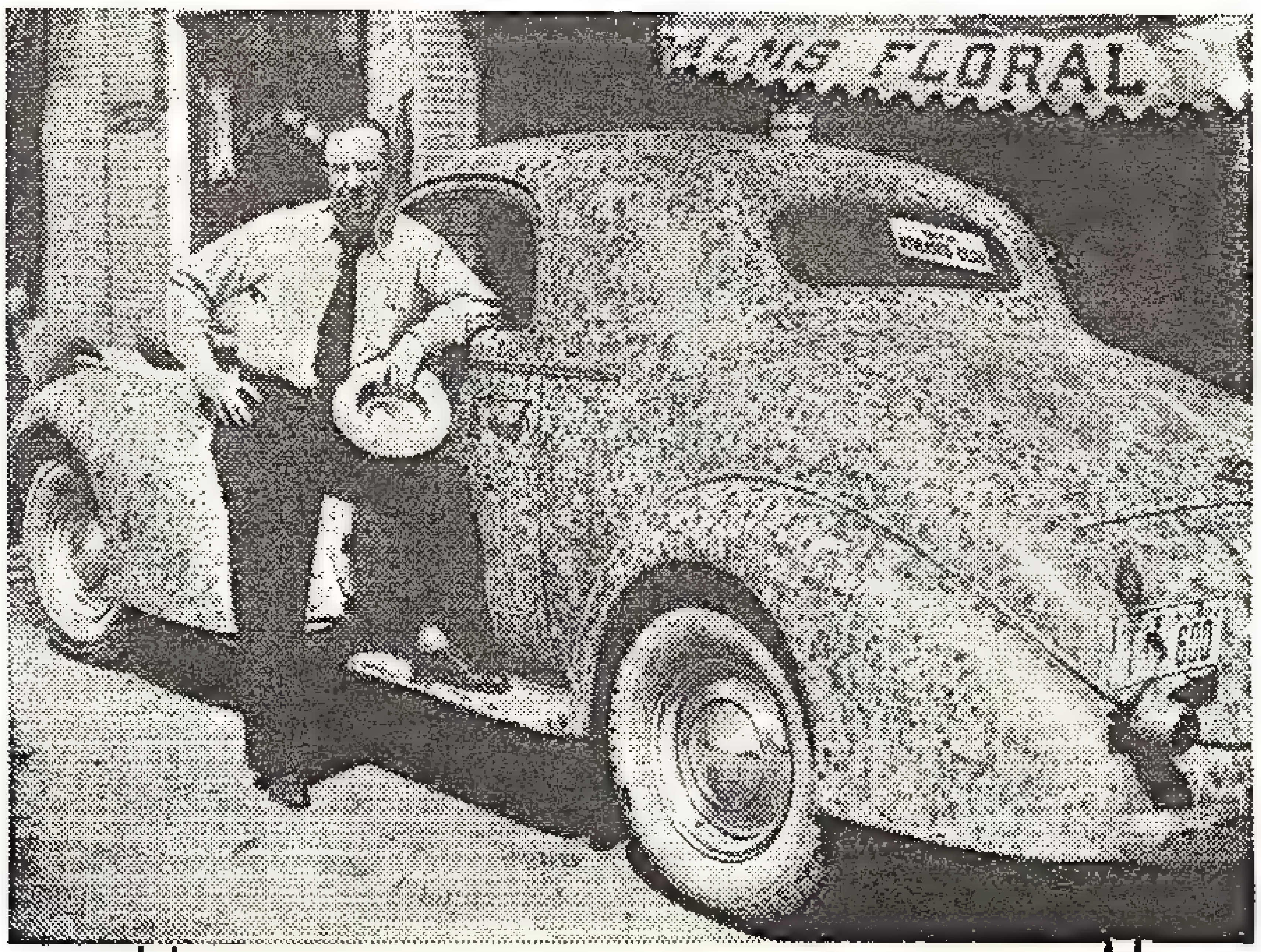
STREET____________________________________

CITY______________________STATE___________

WITH THE HOBBYISTS



Using nothing but a typewriter Ben C. Woodall of Buffalo, New York, has produced striking type portraits of famous people, two of which are shown above. Many of Woodall's portraits are autographed. His prized ones include Fred Astaire, Herbert Hoover, Ben Bernie, Clark Gable, Rudy Vallee, Walter Winchell, Katherine Cornell, Howard and Jane Thurston, Claudette Colbert and others. Wallace Beery and Dolores Del Rio's portraits appear above with their creator shown in the circle.



Ed Hadley, left, a business man of Casper, Wyoming, claims the distinction of possessing one of the most unusual of all stamp collections. The body of his car is the album for more than 10,700 postage stamps. Mr. Hadley engaged the services of five girls who worked six weeks pasting the postage stamps on the body, headlights and fenders of the car.

Henry Reider, left, member of the University of Nebraska Museum Staff spends his spare time gathering bones from prehistoric animals for use in making unusual musical instruments. He is shown with a xylophone which he made from rhinoceros rib bones.

When not on duty Harold Robinson, a Greenwich, Conn., traffic officer, operates amateur radio station W1BUN, communicating with fellow amateurs in all parts of the United States and Canada. Robinson along with other Eastern amateurs played an important part in handling messages from the flooded areas of New England last spring.

Foreign Stamps Commemorate Statue of Liberty

America's famous Statue of Liberty which on October 28, 1936 celebrated its Fiftieth Anniversary is not only pictured on the United States fifteen cent stamp, but on the stamps of four foreign countries as well. France, Spain, Uruguay and Peru have honored the world famous statue with special stamp issues, three of which are shown here. Although suggested for other U. S. stamps the government has limited its use to the black fifteen cent issue. The statue, which stands in New York's harbor, was presented to the U. S. by the French people in appreciation of assistance rendered them during the Franco-Prussian War.

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

$2,000.00 for 1c. We Guarantee to Pay World's Highest Prices, Large Cents up to $2,000.00 each 1909 Cents $10.00, 1860 Cents $50.00, 1890 Cent $20.00, 1913 Liberty Head Nickel $350.00, 25c before 1916 $300.00, 50c before 1916 $750.00, Other 50c before 1936 $60.00. Gold Coins $5,000.00, Lincoln Cents before 1932, Half Cents, Half Dimes, Foreign Coins, Paper Money and Thousands of Others to $2,500.00 each. Know What Your Coins Worth, Send Dime For World's Largest 10c Complete Illustrated Catalogue. Romanocoinshop, Dept. 159, Nantasket, Mass.

SUPER-WONDER Packet offered, containing 60 different stamps from Afghanistan, Transjordania, North Borneo, Manchukuo, Sudan, Macao, Iraq, Charkhari, French and British Colonies, including natives, beasts, ships, etc., all for 5c to approval applicants. Big illustrated lists included. Kent Stamp Company, Box 87-Z (G. P. O.), Brooklyn, N. Y.

50 DIFFERENT Stamps cataloging over $1.00 only a dime to approval applicants. 20,000 different stamps at prices ranging from 1c. All stamps guaranteed genuine. A fine selection of U. S. revenues at 1c and up. Address F. G. Stein, Dept. 214, 7360 N. Seeley Ave., Chicago.

GIANT Netherlands Commemorative Triangle, Jubilee, Airmails, Pictorials in Mammouth Collection—10c, with Double Premium Approvals. Free Airmail Collection given regular customers. Tru-Value Stamp Service, Box M1412, Hartford, Connecticut.

BRITISH TURKISLANDS—Also Congo's—Montecarlo—Nigercoast—Uganda—Djibouti—Ecuadorian—Ivorycoast—Ubangi—Countries collectors need. Free for 5c postage. EMPIRE STAMP SHOP, Dept. MM., TORONTO, CANADA.

NEGRI Sembilan, Siberia, Bicolored Columbian Airpost, Cheery French Colonies, Beautiful Trinidad Pictorial, Scarce Perak. Everything 5c with Approvals! "Saxon", Albee Bldg., Brooklyn, N. Y.

LARGE SPANISH Ship stamp. Azerbaijan, Cameroons, Chad, Dahomey, Ubangi in packet of 57 stamps. All for 5 cents with approvals. Swedell, 3129 Garfield Ave., Minneapolis, Minn.

107 DIFFERENT, Gabon, Congo, Algeria, Guinea, etc., 5c to approval applicants. Extra—Airmail Packet Free!! Hunziker, Box 225W, Minneapolis, Minnesota.

STAMPS! 100 diff. 3c; 500 diff. 35c; 1,000 diff. 90c! Illustrated Album (4000 spaces) 22c. Approvals sent. Tatham Stamp Co. (D9) Springfield, Mass.

MONTHLY Stamp Magazine, 6 months and 25 foreign stamps, 25c. American Stamp Journal, Cedar Rapids, Iowa.

FREE! 15 different Peru to approval applicants, enclosing postage. William Ranson, 3555 Fullerton, Chicago.

FREE!!! King George Memorial Packet, 15 varieties. Postage 3c. Roberts, 901-T Fourth, Baycity, Michigan.

UNITED STATES—Elaborate Pricelist free. 45 different 10c. 75 different 30c. Sidenburg, Baroda, Mich.

400 DIFFERENT British Colonials with Jubilees $2.00. Sanders, 90, Newlands, Southampton, England.

VALUABLE Information Free!! No approvals. Collector, Postfach 20, Porzellangasse, Vienna, Austria.

CUBA and Latin-America Approvals. M. F. Melendi, Apartado 2511, Havana, Cuba.

COINS

$5.00 TO $500.00 EACH paid for Old Coins. Keep all old money. Get posted. Send 10 cents for Illustrated Coin Value Book, 4x6. Guaranteed Buying and Selling Prices. Coin Exchange, Box 17, Le Roy, N. Y.

COMMEMORATIVE $½s. Lincoln, Texas, San Diego, Oregon, $1.50 each. Illustrated Catalogue 25c. Norman Shultz, Salt Lake, Utah.

FREE: Foreign Coin, Banknote and Large Illustrated coin catalogue, for 4c postage. Approvals sent. Tatham Coinco, Springfield-9, Mass.

COINS, Beadwork, Indian Relics, Minerals, Books, Curios, Stamps. Catalogue, 5c. Indian Museum, Northbranch, Kansas.

INDIAN CURIOS

15 ARROWHEADS, Spearhead, Lancehead, gempoint 99c. Firearms. 120,000 Bargains. Photolist 10c. Museum, Rutland, Illinois.

How To Secure A Government Position

Why worry about strikes, layoffs, hard times? Train now for a Government job. Increased salaries, steady work, travel, good pay. Let me help you become a Railway Postal Clerk, Post Office Clerk, City Mail Carrier, Rural Carrier—or help you get any position in Government Classified Service you want. I was a Secretary Examiner of Civil Service Commission for 8 years. My coaching has helped thousands. My 32-page book tells about Government jobs — and how my instruction helps to qualify you to get the one you want. Send for a free copy TODAY.

FREE BOOK

HOW TO SECURE A GOVERNMENT POSITION

A. R. Patterson, Civil Service Expert
PATTERSON SCHOOL, 431 Case Bldg., Rochester, N. Y.
Send, without obligation, free book "How to Secure Government Position."

Name ____________________

Address ____________________

FOR Real FUN Play A Soprani ACCORDION

Easy TO PLAY

● If you want to be *really* popular, have *all* the fun, the center of attraction *everywhere*, just learn to play this thrilling instrument from Italy. A complete band or orchestra in itself, and so easy to learn to play. You'll master this *easier* Soprani in *no time*, and you'll have real fun from the start. Don't delay. Big future. Send postal for beautifully illustrated literature. No obligation. Easy terms. Write today sure. 122

SOPRANI, INC. DEPT. 134, 630 S. WABASH AVE. CHICAGO, ILL.

HAVE YOU A RADIO IN YOUR CAR?

Did you know that the *Radio Builders' Manual* describes a fine 6-tube auto set? Why not get a copy and build your own? Send 50c today to
MODERN MECHANIX PUBLISHING CO.
GREENWICH, CONN.

INVENTORS PATENT YOUR IDEAS

Get this FREE Book

Protect the future profits from your idea by securing a U. S. Patent. Delays are often dangerous. I give prompt and personal attention to your case—nothing is entrusted to unskilled assistants. The Patent Office itself urges you to select a Competent Registered Patent Attorney in order to protect your interests properly. Therefore, before doing anything else, send for my NEW FREE BOOK and get the full facts, and with it I will send you my FREE "Record of Invention" form. All correspondence strictly confidential. Mail Coupon TODAY

How to get a PATENT
L. EDWARD FLAHERTY

L. EDWARD FLAHERTY
REGISTERED PATENT ATTORNEY

727 International Building WASHINGTON, D. C.

Please send immediately your FREE book and Record of Invention Form.

Name ....

Address ....

City .... State ....

Great Inventions

[*Continued from page* 138]

inventors, they loom large in comparison with others of her sex. Less than two per cent of the patents have been granted to women—a proportion practically constant since 1900.

In every branch of sport may be found famous athletes who have succumbed to the inventive urge. Walter Hagen patented a golf ball having a surface design which, he claims in his patent papers, makes the ball "accurate in flight as well as in putting and rolling."

Rene Lacoste, internationally known tennis player, has patented numerous inventions in racket structure. Sandow, the "strong man," devised a strength-measuring apparatus and patented it.

In baseball, player-inventors are almost as common as player-managers. If you have ever seen Max Carey, formerly of the Pittsburgh Pirates, slide into a base, you may have wondered what saved his hide. Well, Max always used a special sliding pad which he himself invented and patented.

On the other hand, the late Benjamin Shibe, owner of the Philadelphia Athletics, patented a mass of inventions on player equipment, including baseballs and baseball-making machinery. Thomas Shibe, late president of the Athletics, and John Shibe, now president of the club have both contributed inventions along the same line. In fact, it is under the Shibe patents and in the Shibe plant that the balls used by the American League are manufactured.

Charles Brickley, former Harvard football star and All-American fullback, is said to have been the greatest dropkicker of all time. He wore a patented shoe of his own invention.

From the side lines the coaches give thought not only to the plays, but to the equipment needed by the players. For instance, we might mention Glenn S. ("Pop") Warner, dean of coaches, whose patents include a "shoulder protector."

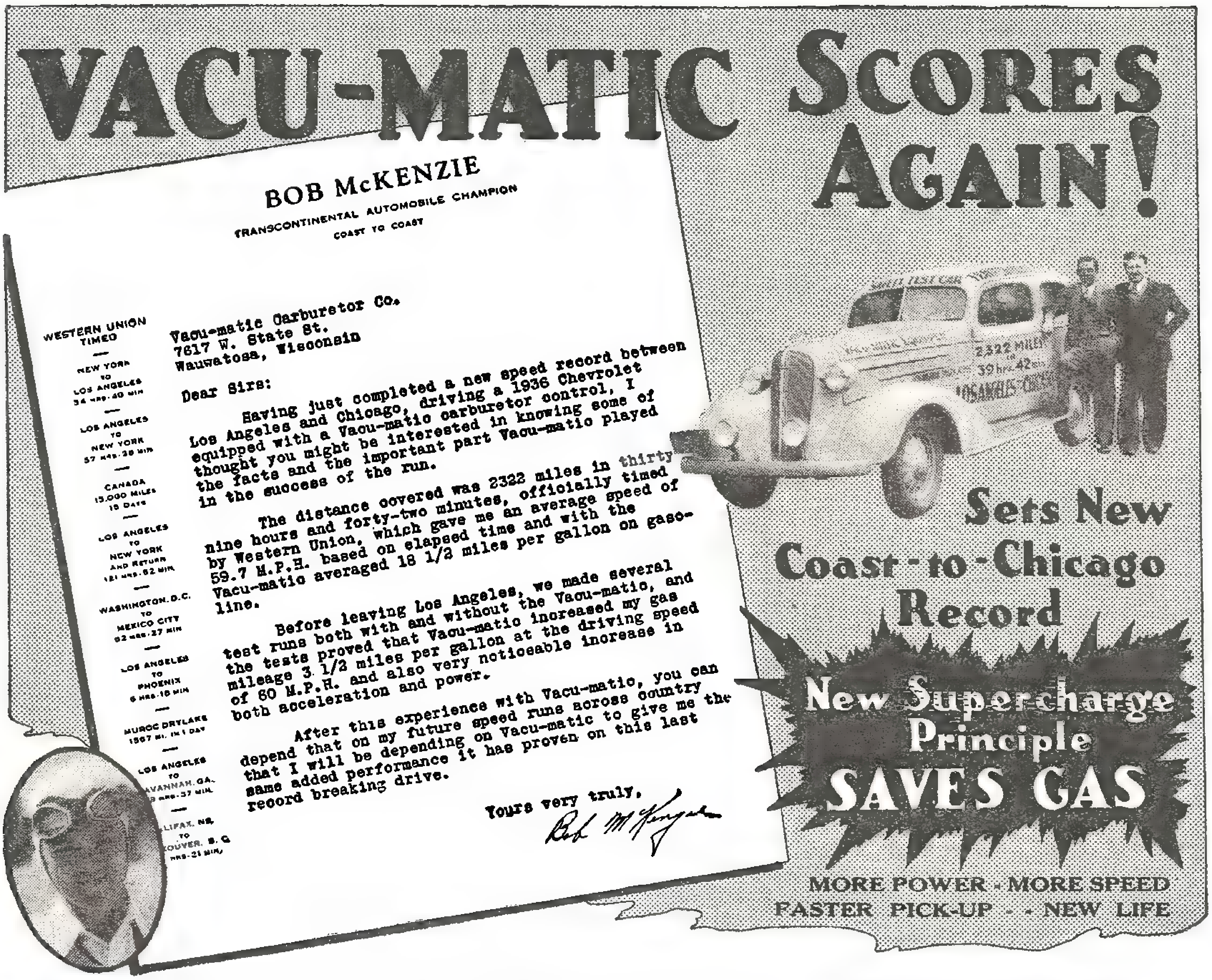
Around The World By Air

[*Continued from page* 53]

especially at high altitudes. A remarkable development in aviation which was not available until a few years ago is the "gear shift of the air"—the controllable pitch propeller operated from the engine oil pressure. And there are the new drives to operate vacuum pumps used to actuate retractable landing gears.

I marveled as I sat in the control cabins of airplanes and as great areas of geography were left behind beneath us I learned of down-draft carburetors, wing de-icers, the complete shielding of the ignition wiring system to prevent interference with radio reception, and many other aviation achievements.

[*Continued on page* 153]



VACU-MATIC SCORES AGAIN!

BOB McKENZIE
TRANSCONTINENTAL AUTOMOBILE CHAMPION
COAST TO COAST

WESTERN UNION TIMED

NEW YORK TO LOS ANGELES 34 HRS. 40 MIN

LOS ANGELES TO NEW YORK 57 HRS. 28 MIN

CANADA 15,000 MILES 15 DAYS

LOS ANGELES TO NEW YORK AND RETURN 121 HRS. 52 MIN

WASHINGTON, D.C. TO MEXICO CITY 92 HRS. 27 MIN

LOS ANGELES TO PHOENIX 6 HRS. 10 MIN

MUROC DRYLAKE 1567 MI. IN 1 DAY

LOS ANGELES TO AVANNAH, GA. HRS. 37 MIN.

LIFAX, NS. TO OUVER, B. C HRS. 21 MIN.

Vacu-matic Carburetor Co.
7617 W. State St.
Wauwatosa, Wisconsin

Dear Sirs:

Having just completed a new speed record between Los Angeles and Chicago, driving a 1936 Chevrolet equipped with a Vacu-matic carburetor control, I thought you might be interested in knowing some of the facts and the important part Vacu-matic played in the success of the run.

The distance covered was 2322 miles in thirty nine hours and forty-two minutes, officially timed by Western Union, which gave me an average speed of 59.7 M.P.H. based on elapsed time and with the Vacu-matic averaged 18 1/2 miles per gallon on gasoline.

Before leaving Los Angeles, we made several test runs both with and without the Vacu-matic, and the tests proved that Vacu-matic increased my gas mileage 3 1/2 miles per gallon at the driving speed of 60 M.P.H. and also very noticeable increase in both acceleration and power.

After this experience with Vacu-matic, you can depend that on my future speed runs across country that I will be depending on Vacu-matic to give me the same added performance it has proven on this last record breaking drive.

Yours very truly,
Bob McKenzie

Sets New Coast-to-Chicago Record

New Supercharge Principle SAVES GAS

MORE POWER - MORE SPEED
FASTER PICK-UP - - NEW LIFE

ESTABLISHING new mileage records on cars in all sections of the country, the Vacu-matic again scores in a new speed record established by Bob McKenzie transcontinental automobile champion. Los Angeles to Chicago — 2,322 miles in 39 hours and 42 minutes— driving 75 and 80 to maintain a speed average of 59.7 miles per hour!

Here is speed—a gruelling grind—where quick accelaration, greater top speed — and less stops for gasoline mean those precious moments saved that make new speed records possible

The same Vacu-matic that helped Bob McKenzie establish this speed record and gave him such fine gas savings is now available for all car owners. It is positively automatic—simple to install—inexpensive—and pays for itself many times over in gas savings

Automatic - - Nothing Like It!

Vacu-matic is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you—so practical it will save you many dollars on gas costs.

Agents and Salesmen

VACU-MATIC offers a splendid opportunity for unusual sales and profits. Valuable territories now being assigned. Check and mail coupon.

Fits All Cars

VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and *sealed at the factory*. Nothing to regulate. Easily attached in ten minutes.

The VACU-MATIC Co. Wauwatosa, Wis.

Guaranteed Gas Savings

VACU-MATIC must prove itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up and more power, or it costs you nothing. "On my V-8 Ford it works miracles", says Ralph Fields. James Seeley —"On an International Truck on a round trip to Cleveland, 385 miles, it saved 19 gallons of gas." A. V. Grove —"On the Buick it showed 5 miles more per gallon." F. S. Peck—"I average 22 miles per gal. on my Plymouth, an increase of 7 miles, for a saving of $15.00 a month, or $180.00 a year." Wm. Lyons—"Averaged 25 miles on a gal. with a Model A Ford at 40 miles per hour."

Free Details

You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation—so get the facts now! Write today!

FREE OFFER COUPON

THE VACU-MATIC COMPANY
7617-271 W. State St., Wauwatosa, Wis.

Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

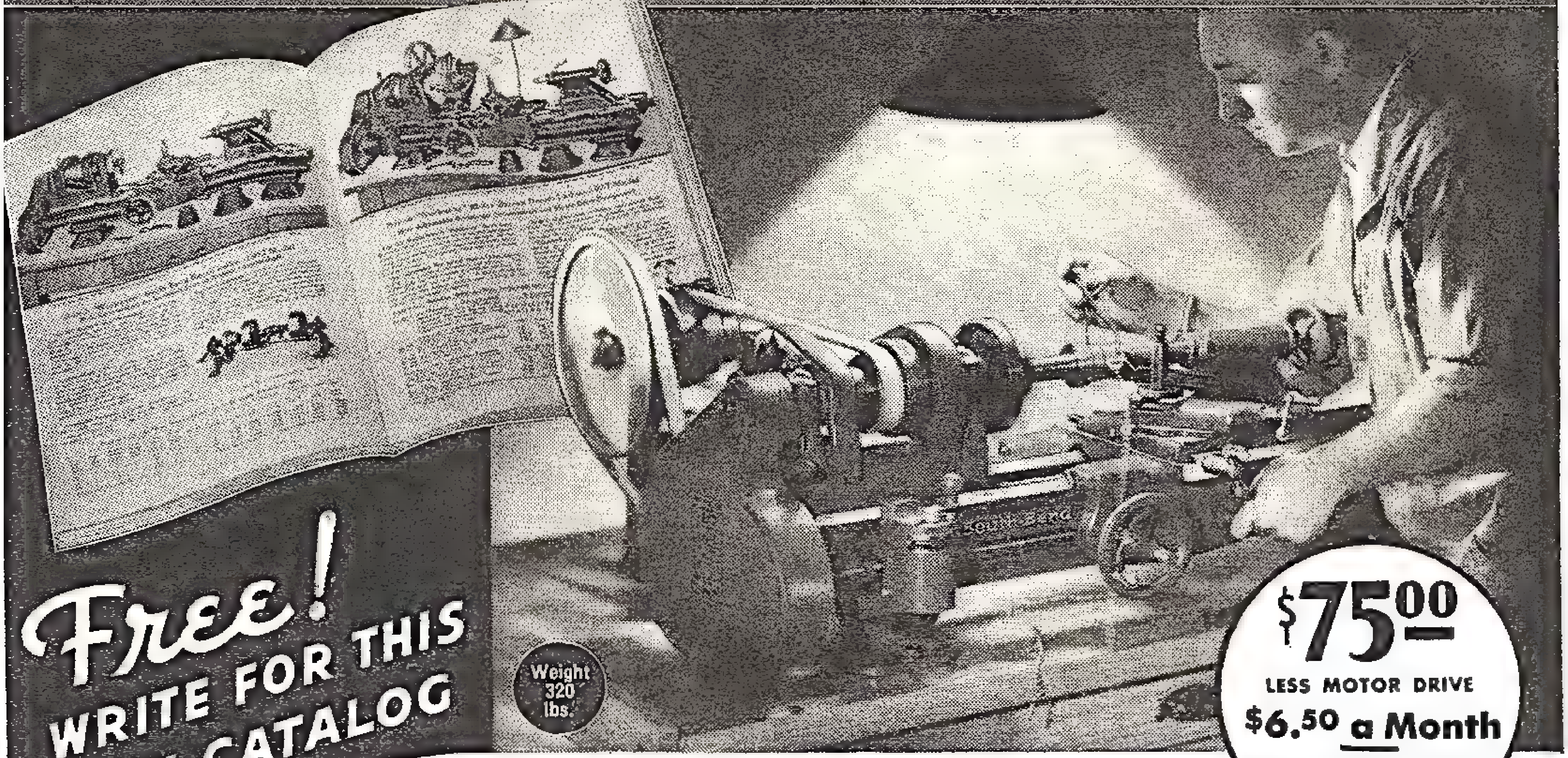
Name ....

Address ....

City .... State.............

☐ Check here if interested in selling proposition.

New 1937 SOUTH BEND *Back-Geared Screw Cutting* PRECISION LATHES



Free! WRITE FOR THIS NEW CATALOG 15 K

$75.00 LESS MOTOR DRIVE $6.50 a Month AN IDEAL XMAS GIFT

No. 415-YA 9⅛″ swing by 3′ bed Workshop Bench Lathe with Horizontal Motor Drive, ¼ h.p. Reversing Motor, Switch and belt tension countershaft as shown above **$104**
($28 Down, $7 a month for 12 months)

THE new 1937 model 9-inch Workshop Lathe is a Back-Geared Screw Cutting Precision Lathe, with Twin Gear Reverse to lead screw, Ball Thrust Bearing on Spindle, Longitudinal Screw Feed to Carriage, Precision Lead Screw for cutting screw threads—and scores of other important features.

Especially recommended for fine accurate work in the plant, shop and toolroom. Used by all important industries in this country and abroad. Takes 38 practical attachments for milling, grinding, draw-in collet chuck work, and many other manufacturing jobs.

Write for Catalog 15K, illustrating and describing the new 1937 Model Workshop Lathe in 8 different drives—4 bed lengths. Shows the 38 attachments for use with this lathe. A valuable booklet to anyone interested in metal working lathes.

Use coupon below.

SOUTH BEND LATHE WORKS
514 E. Madison Street
South Bend, Ind., U.S.A.

5 OTHER SIZES 9″, 11″, 13″, 15, 16″ SWING. IN ALL BED LENGTHS PRICED $87 to $200.

No. 192-C 16″ x 6′ South Bend Quick Change Gear Underneath Belt Motor Driven Lathe with 3-phase motor, reversing switch, complete as shown. Weight 2300 lbs. **$779**
$155 Down, $40 a month for 17 months)

South Bend Lathe Works,
514 E. Madison St.,
South Bend, Ind. U.S.A.
Please send me your new 1937 Catalog 15-K.
Size of lathe interested in ....
Class of work ....
Name ....
Address...............State..........
City ....

SOUTH BEND *Precision* LATHES

Around The World By Air

[*Continued from page* 150]

The down-draft carburetor guarded against dirt getting into the engines by taking the carburetor intake air from the top of the motor instead of at the bottom where great clouds of dust were churned up when the plane taxied along the ground.

To attempt to look ahead in the aviation industry literally takes one's breath away. I thought, as I traveled, that I was flying in the last word in heavier-than-air planes. Now I am learning of engines of 1,000 horsepower. More than 600 Wright engines of 1,000 horsepower have been ordered by the United States Army Air Corps for the new Boeing and Douglas bombers now being built to increase the strength of American military aviation. These new power plants have a fuel consumption which closely approaches that of a Diesel engine. The Dutch have ordered new airliners to be equipped with 1,000 horsepower engines. American Airlines and TWA will use them in this country.

Behind the scenes in all these development are advances in manufacturing. One of these revealed to me was the nitriding of the interior of cylinders in which the pistons move up and down. As the results of nitriding, the hardness of the cylinder interiors has been increased three times. They become so hard they will cut glass. This, of course, means that the cylinder walls have great wear resistance and will last materially longer.

Then there is magnafluxing. Manufacturers, after machining and polishing each steel part for an airplane motor—magnetize it. Then they immerse it in an oil solution which has fine iron particles kept in suspension by an air agitator. If there is a surface crack or defect in the steel, the edges of the break form the two poles of a magnet and attract the iron particles. Hence, the break is shown by a thin black line. Defects which might not be discernible even under a microscope of 10 to 20 diameter enlargement strength are clearly shown up in magnafluxing.

Materials for MM Homes

[*Continued from page* 39]

cellar. Mary felt that they should have real ground-breaking ceremonies, like those which are held for million dollar public buildings. The event was going to be that important to her and Tom, anyhow! (*To be continued next month*)

MM HOME BLUEPRINTS

Four sets of complete working blueprints and specifications, ready to turn over to a contractor after advice from a local architect, can be obtained for $25.00 for either the $3,500 or the $5,500 home. Address orders to Modern Mechanix Publ. Co., Fawcett Bldg., Greenwich, Conn.

This MACHINISTS' Home-Study Course

helps men get ahead

Newly assembled—specially priced—these five recent books give you the practical facts on modern machines, up-to-date methods you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problems, increase your efficiency, with the new

Library of Modern Machine Shop Practice

5 volumes—2000 pages—1600 illustrations

(*A combined home-study course and reference library*)

This library of machine shop practice was written for practical men. It gives you the best methods for every kind of machine shop work. It deals fully with lathes, drills, and other machine tools and their operation, automatic screw machines, speeds and feeds, gear design and production, punch and die work, metal finishing, etc., etc. Plainly written—completely illustrated—the best kind of help to the machine-shop man who wants to advance himself.

No money down—special price—easy payments

FREE EXAMINATION COUPON

McGRAW-HILL BOOK CO., Inc., 330 W. 42nd St., NEW YORK, N. Y.

Send me for 10 days' free examination the Library of MODERN MACHINE SHOP PRACTICE. If satisfactory I will send $1.50 in 10 days and $3 monthly until the special price of $16.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

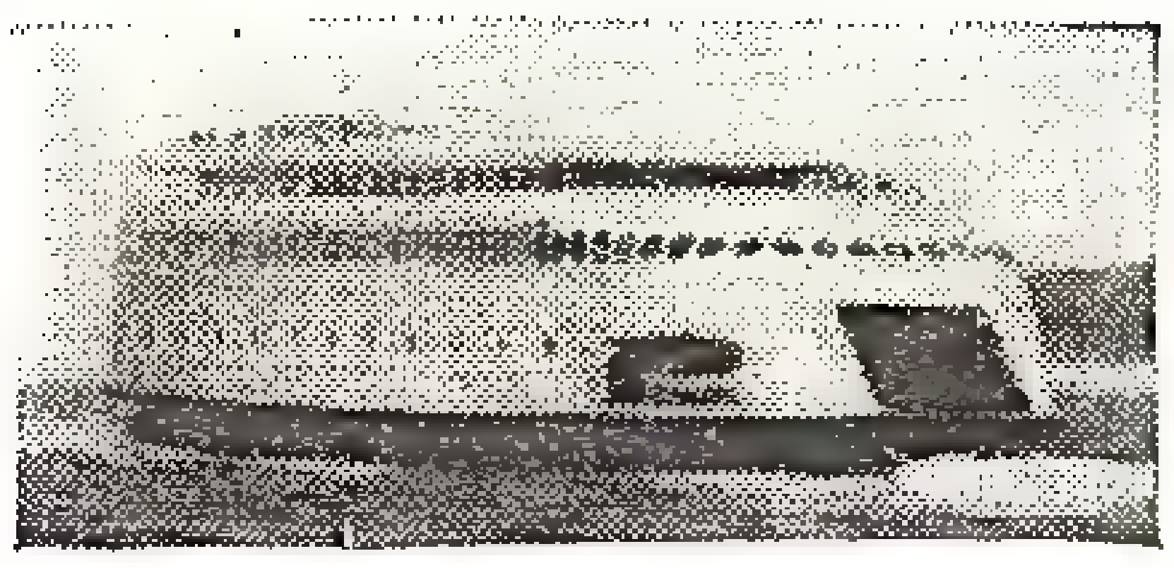
Name ____________________

Address ____________________

City and State ____________________

Position ____________________

Company ____________________ MMx-1-37



Courtesy DIESEL POWER

DIESEL POWER

A Great American Industry

The internal-combustion engine represents man's supreme triumph of machine power. Expert Diesel operators are in demand. Here is real opportunity for mechanics, draftsmen, owners of shops, motormen, farmers and all others employed where Diesel replacements will be made. Get this knowledge. Send for FREE booklet.

RADIO

holds rich rewards for trained men

The big opportunities in Radio will be enjoyed by trained men. The International Correspondence Schools Radio Course, prepared by leading authorities and constantly revised, will help make you a trained service man! A fascinating book – FREE.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 2322-K, Scranton, Penna.

Please send information on course checked.

☐ DIESEL POWER ☐ RADIO
☐ Mechanical Engineering ☐ Automobile Course
☐ Aviation Engines ☐ Air Conditioning

Name____________________**Age**______

Address____________________

Expanding Business Greets New Ideas

Vegetable and Fruit
Dicing-Slicing-Shredding
Samuel J. Bell
15 Lyman St
Crown Hotel

This machine will dice, slice, or shred any vegetable or fruit in one operation of the foot petal. A punch is set at the top and a die at the bottom. Each operation requires a die.

A universal welding generator that welds all thicknesses of plate from one-sixteenth to six inches and metals such as steel, copper and aluminum.

A new type window lock that has a bolt and latch combination that can be safely locked with a special key.

A kerosene stove designed for keeping auto engines warm in cold weather that operates at a cost of about two cents per day.

This oscilloscope enables music students to see as well as hear music sounds. Sound wave pattern is traced on a small screen.

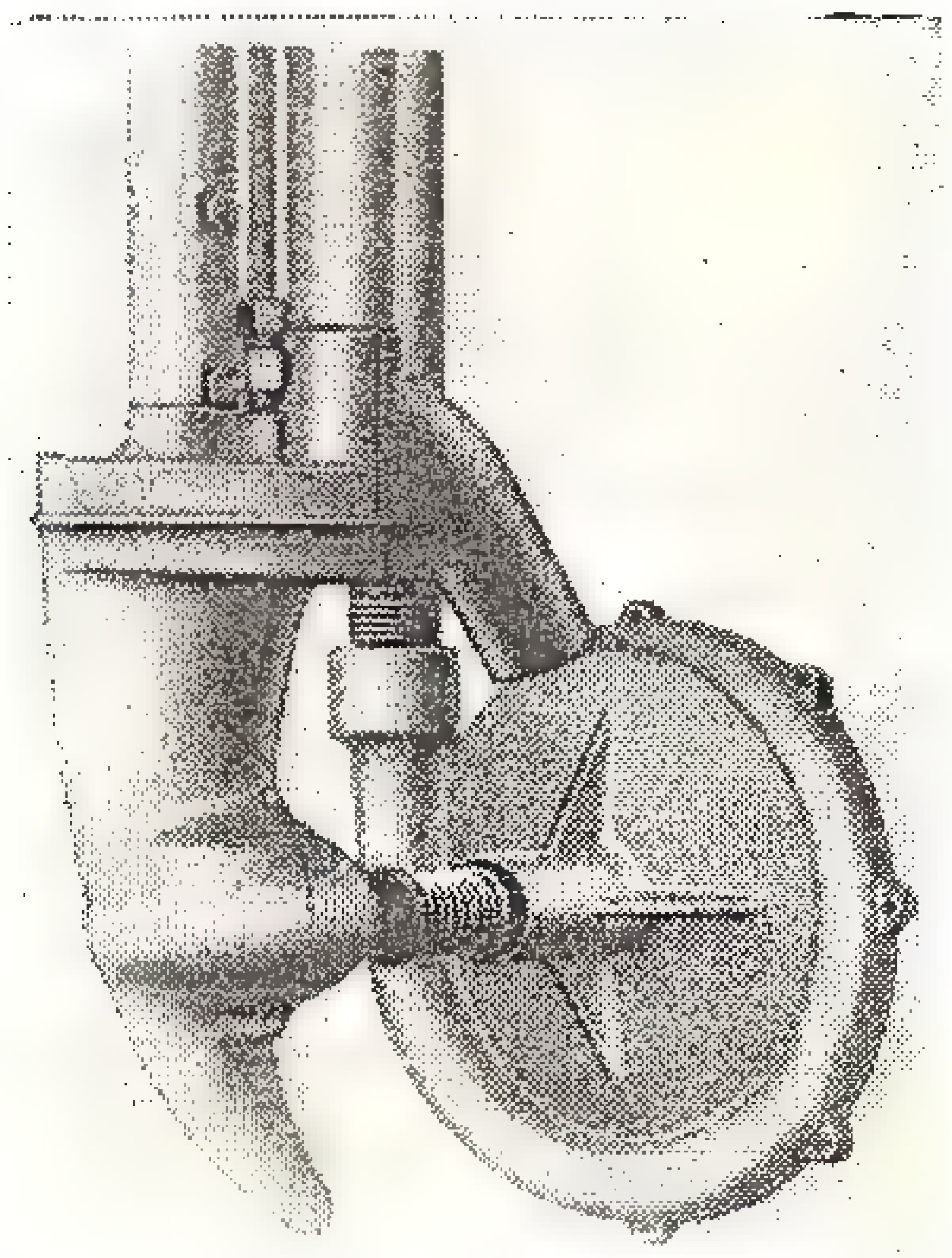
A specially designed vacuum cleaner for automobile use in which the dirt is collected in an easily emptied metal container. Operates on AC or DC current. Small in size, it is conveniently carried.

A coffee roaster that enables the product to be freshly roasted at the point of sale.

Hexagonal packages designed for convenience in storage.

A portable dance "floorette," a folding miniature floor that can be laid on top of rugs.

A machine safety guard that gives double protection to the operator because it has both a stationary and a sweep guard.



Attached in three minutes, this device converts an outboard marine motor into an efficient water pump suitable for use at home or camp.

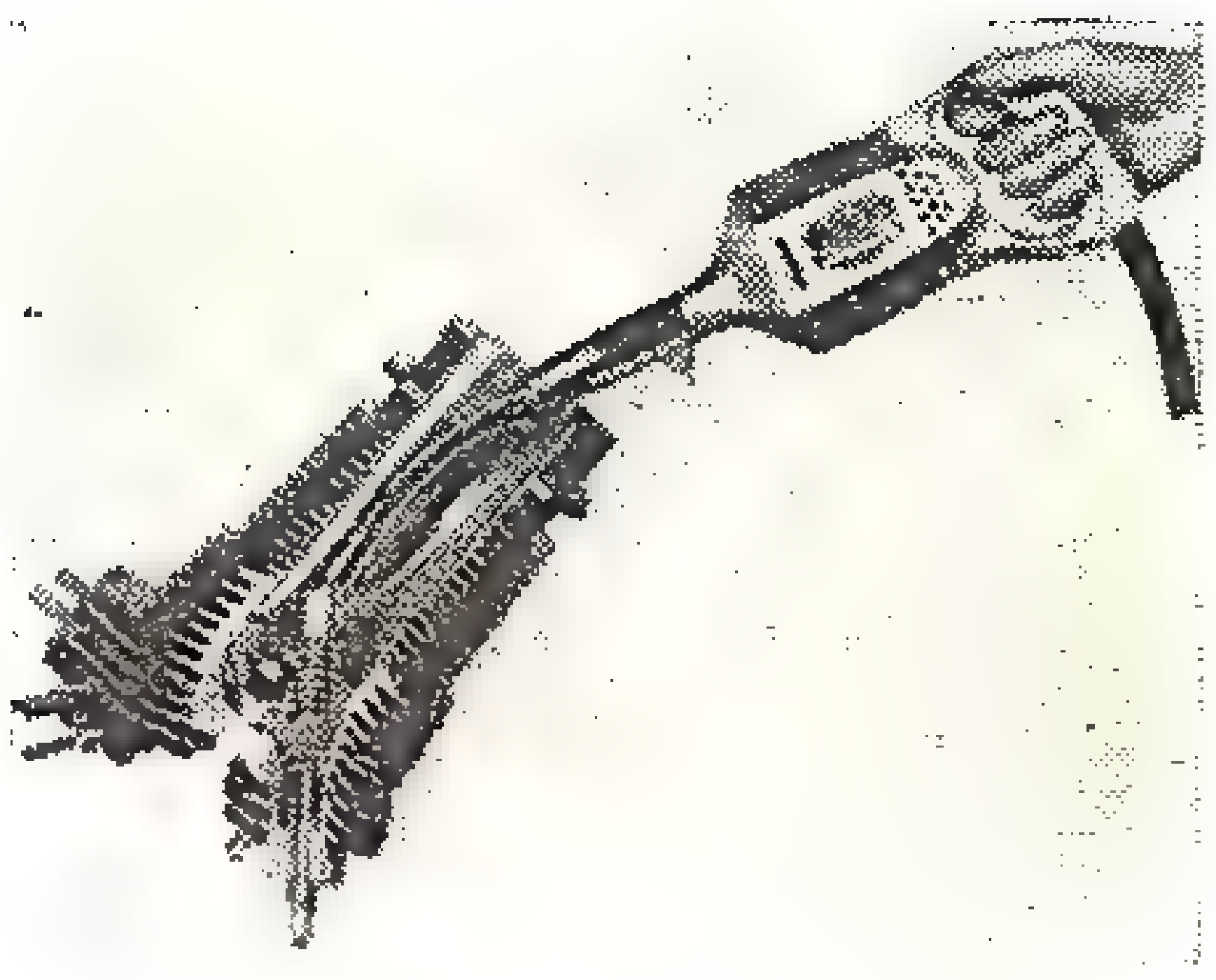
A new soap pulverizer for lavatory use which, at the twist of a crank, converts a cake of fine, milled soap into a pulverized form and feeds it to the hands of the user.

An automatic welding torch lighter that operates on 110 volts or less and which lights the torch when a magic button is touched with the torch tip.

An x-ray projecting machine that enables a dentist's patient to view his teeth defects on an enlarged scale upon a screen.

A new mechanical color analyzer that reduces all hues to plain black and white of different densities and translates color shades into curves plotted on graph paper.

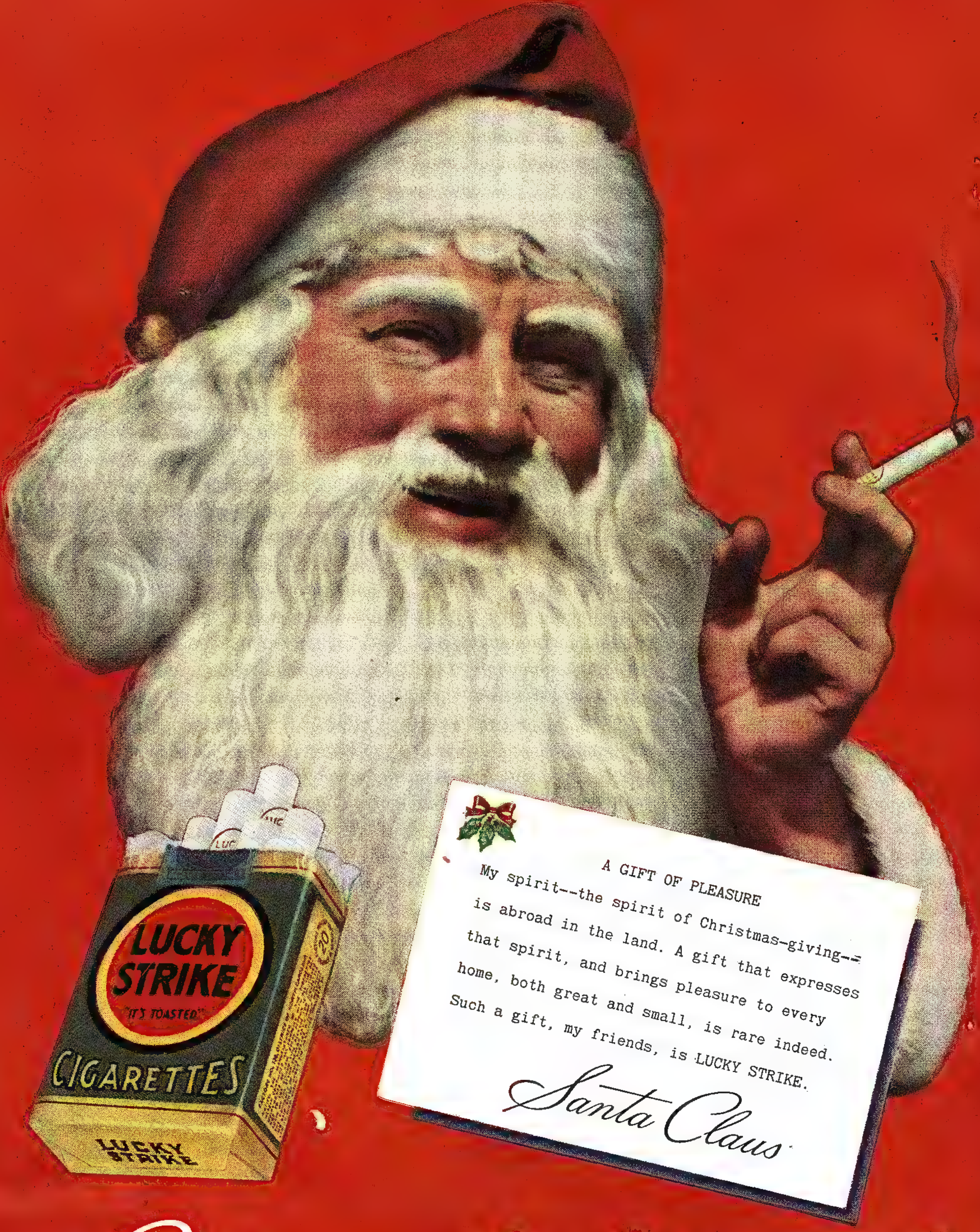
A new electric light bulb has a special glass that filters out rays harmful to eye nerves.



The vibrating spindle of this valve seat grinder lifts the stone from the seat each revolution, throwing off waste particles in revolving.

Editor's Note—Addresses of manufacturers of these and other new products in this issue can be obtained by sending a stamped, self-addressed envelope to Modern Mechanix Publishing Co., Information Bureau, Fawcett Building, Greenwich, Connecticut. Manufacturers are invited to submit material for publication on this page.

Inside Back Cover missing


LUCKY STRIKE
"IT'S TOASTED"
CIGARETTES
LUCKY STRIKE
20

A GIFT OF PLEASURE

My spirit--the spirit of Christmas-giving--is abroad in the land. A gift that expresses that spirit, and brings pleasure to every home, both great and small, is rare indeed. Such a gift, my friends, is LUCKY STRIKE.

Santa Claus

Luckies-a light smoke
OF RICH, RIPE-BODIED TOBACCO—"IT'S TOASTED"

Double Page Spreads

BE A RADIO EXPERT

J. E. SMITH, Pres., Nat'l. Radio Institute
The man who has directed the home study training of more men for the Radio Industry than any other man in America.

MANY MAKE $30 $50 $75 A WEEK

I Will Train You at Home—mail coupon for FREE Book

Do you want to make more money? Radio offers you many opportunities for well-paying spare time and full time jobs. And you don't have to give up your present job or leave home and spend a lot of money to become a Radio Expert.

Many Radio Experts Make $30, $50, $75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as $30, $50, $75 a week. Many Radio Experts operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Radio operators on ships get good pay and see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I have trained are holding good jobs in these branches of Radio. Read their statements. Mail the coupon.

There's a Real Future in Radio for Well-Trained Men

Radio already gives jobs to more than 300,000 people. In 1935 over $300,000,000 worth of sets, tubes and parts were sold—an increase of 20% over 1934! Over 1,100,000 auto Radios were sold in 1935, 25% more than in 1934! 22,000,000 homes are today equipped with Radios, and every year millions of these sets go out of date and are replaced with newer models. Millions more need servicing, new tubes, repairs, etc. Broadcasting stations pay their employees (exclusive of artists) more than $23,000,000 a year! And Radio is a new industry, still growing fast! A few hundred $30, $50, $75-a-week jobs have grown to thousands in less than 20 years!

Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

Practically every neighborhood needs a good spare time serviceman. The day you enroll I start sending you Extra Money Job Sheets. They show you how to do Radio repair jobs that you can cash in on quickly! Throughout your training I send you plans that made good spare time money—$200 to $500 a year—for hundreds of fellows. My training is famous as "the Course that pays for itself."

HERE'S PROOF THAT MY TRAINING PAYS

Chief Operator Broadcasting Station

"When I completed 20 lessons, I obtained my Radio Broadcast Operator's license and immediately joined Station WMPC, where I am now Chief Operator."—HOLLIS F. HAYES, 85 Madison St., Lapeer, Mich.

$10 Week in Spare Time

"My work has consisted of Radio set servicing, with some Public Address Systems work—all in my spare time. My earnings in Radio amount to about $10 a week."—WILLIAM MEYER, 705 Ridge Road, Hobart, Ind.

Service Manager For Four Stores

"I was working in a garage when I enrolled with N. R. I. In a few months I made enough to pay for the course three or four times. I am now Radio service manager for the M—— Furniture Co., for their four stores."—JAMES E. RYAN, 1535 Slade St., Fall River, Mass.

Own Business Pays $300 a Month

"I now have my own Radio business which shows three hundred dollars a month profit—thanks again to National Radio."—FRANK T. REESE, 39 N. Felton St., Philadelphia, Penna.

Earned $50 First Month in Spare Time

"I knew nothing about Radio. After four lessons I began servicing Radios, earning $50 the first month. Last winter I made as high as $100 a month in spare time."—G. F. WALTON, 808 West Olney Road, Norfolk, Va.

I Give You Practical Experience

My Course is not all book training. I send you special Radio equipment and show you how to conduct experiments and build circuits which illustrate important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus for use in spare time work from this equipment. This 50-50 method of training makes learning at home interesting, fascinating, practical.

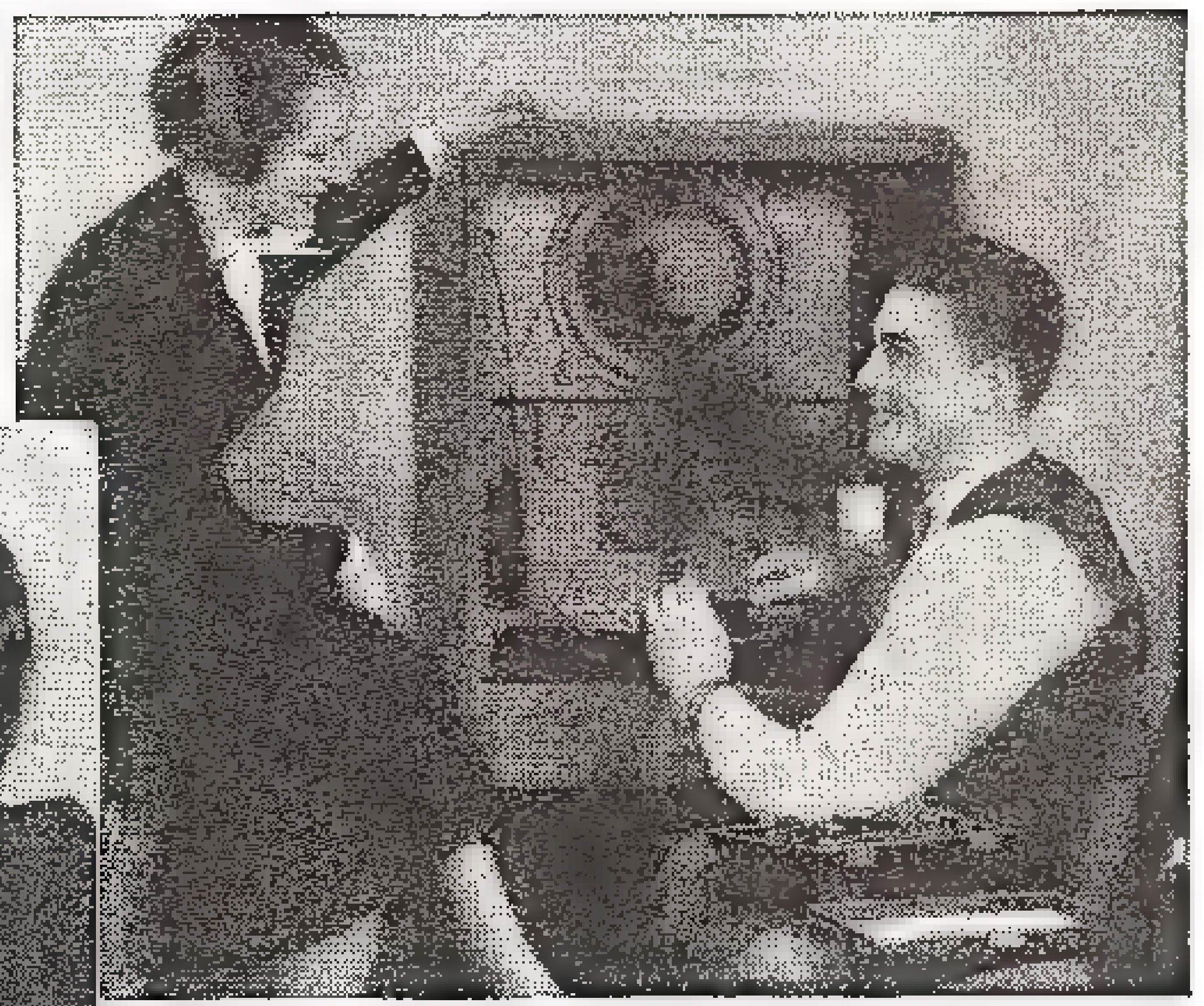
You Get a Money-Back Agreement

I am so sure that I can train you successfully that I agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish. I'll send you a copy of this agreement with my **Free Book.**

Find Out What Radio Offers You

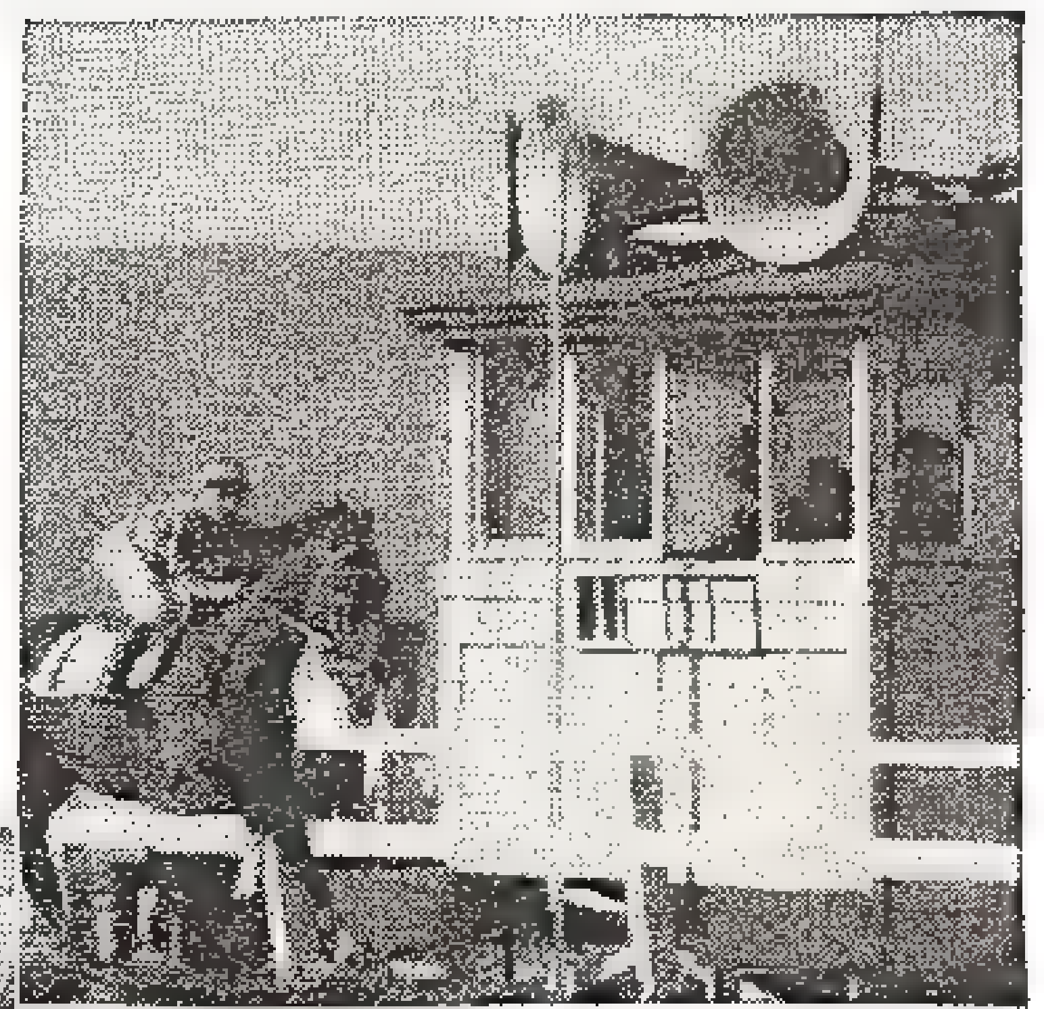
Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It describes Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you actual letters from men I have trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste on a postcard—NOW!

J. E. SMITH, Pres.,
National Radio Institute, Dept. 7AH
Washington, D. C.



Set Servicing

Spare time set servicing pays many $5, $10, $15 a week extra while learning. Full time servicing pays as much as $30, $50, $75 a week.



Broadcasting Stations

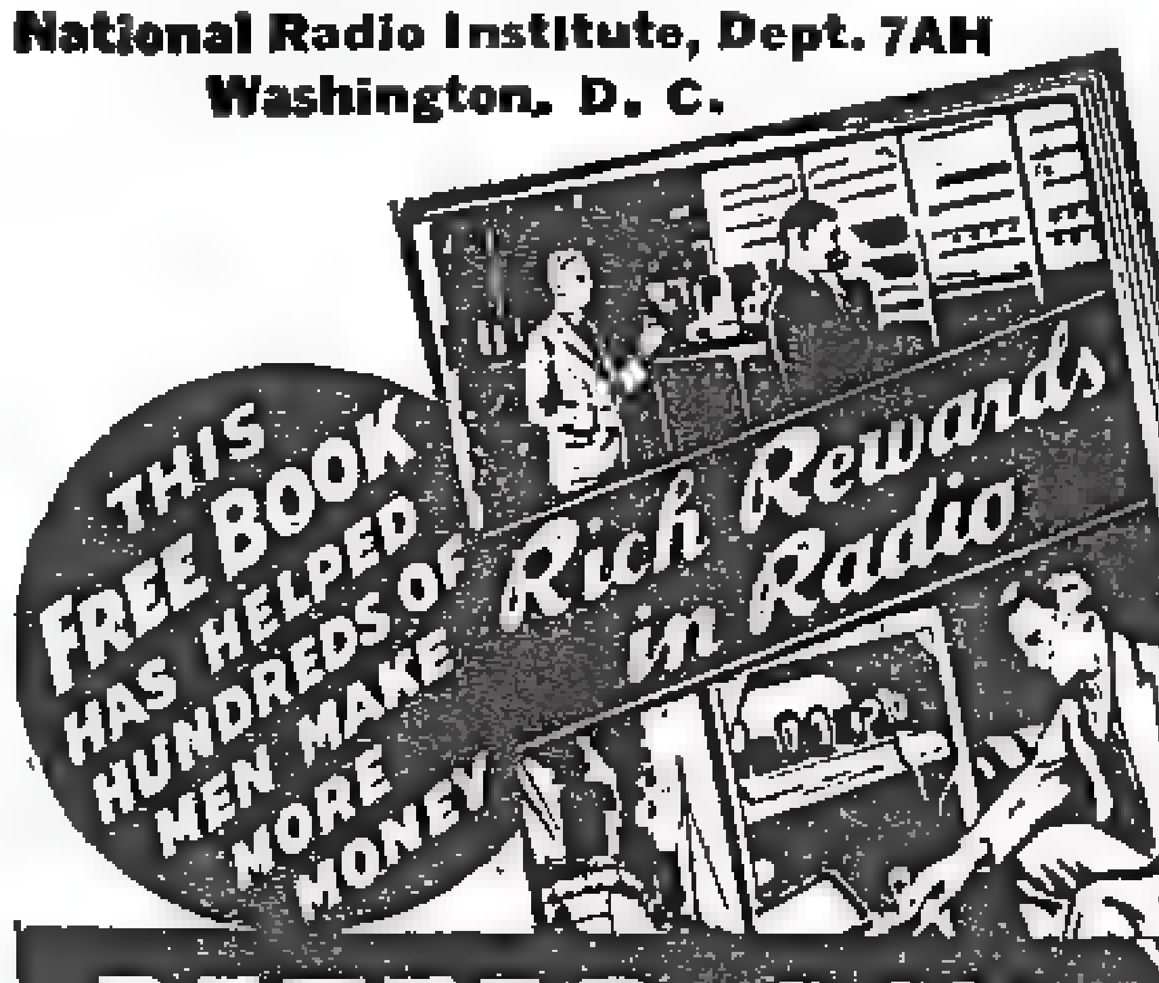
Employ managers, engineers, operators, installation and maintenance men for fascinating jobs and pay up to $5,000 a year.

Loud Speaker Systems

Building, installing, servicing and operating public address systems is another growing field for men well trained in Radio.

Automobile Radio

Another new Radio field — selling, installing, servicing. One million or more auto owners will install radio sets within the next year.


THIS FREE BOOK HAS HELPED HUNDREDS OF MEN MAKE MORE MONEY
Rich Rewards in Radio

THE TESTED WAY TO BETTER PAY

Mail this to get 64 page Book FREE

Mr. J. E. SMITH, President, Dept. 7AH
National Radio Institute, Washington, D. C.

Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

NAME ....AGE ....

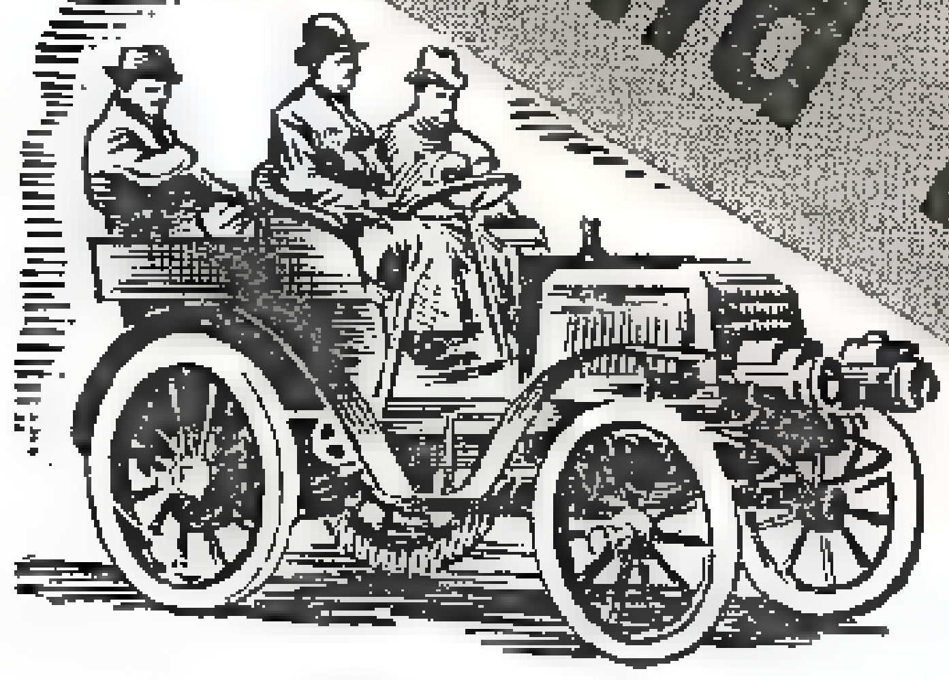
ADDRESS ....

CITY ....STATE ....

INVENTORS Send for Valuable Facts *about* PATENTS and Selling Inventions

David Sarnoff says:

DAVID SARNOFF, once a poor lad and now the famous President of the Radio Corporation of America, in an article in Liberty Magazine states: "Civilization means elimination of unnecessary labor. The sewing machine and the vacuum cleaner save millions of women from backbreaking toil. The tractor makes the farmer's life bearable. The automobile lends wings to us all. The airplane is our magic carpet. It would be madness to slow up invention because our trouble is not that mechanical science moves too speedily, but that the governmental and social sciences move too slowly . . . In a world reorganized to vibrate within certain wave bands, human intelligence will be able to distribute equitably nature's bounties from above and below, and make princes of paupers."



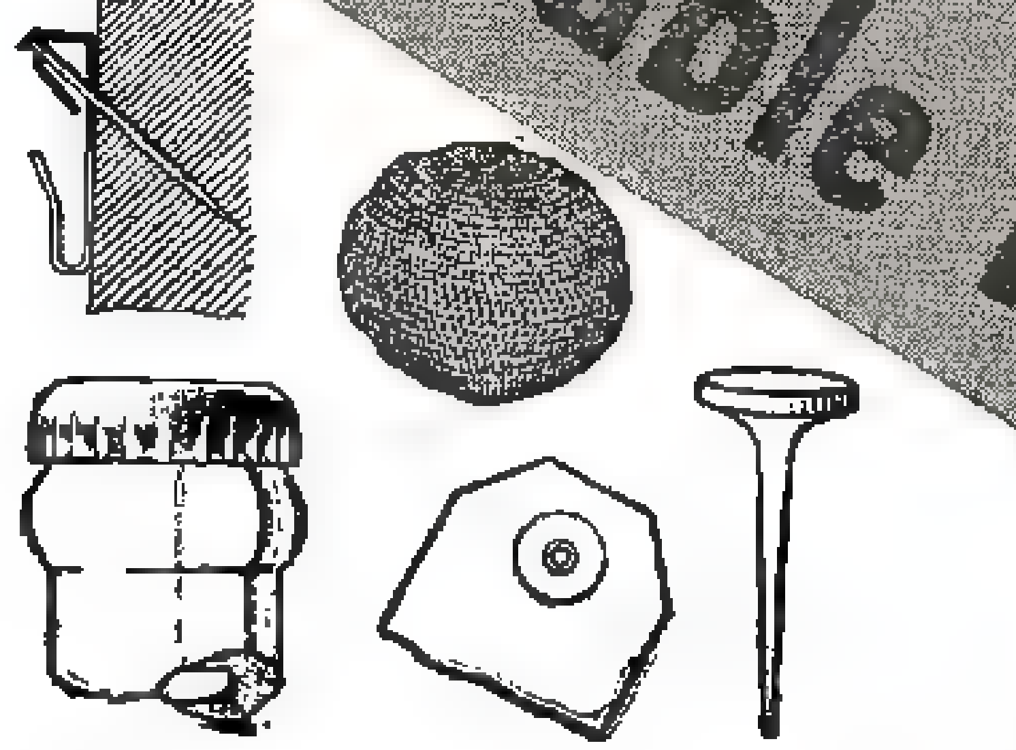
Since the "Horseless Buggy" Days, We Have Helped Inventors

PERHAPS you have already heard about our firm, because one client tells another—and we have served men in every state in the Union, and in nearly every foreign country. We have been working with inventors since 1898. If you have a good invention—or an idea for one—and don't know what Victor J. Evans & Co. can do for you, NOW is the time to find out.

How We Can Help You

Both the Patent Office and the U. S. Supreme Court have made it clear that the inventor needs the assistance of a competent patent lawyer when it comes to protecting an invention. It is one thing to think up a good invention—it is another to get effective patent protection on it.

For more than a third of a century—it has been our business to give sound advice and counsel to inventors. Our free books (described on the opposite page) tell what steps to take first, how to protect yourself, how the laws protect you, what you must do, when to offer your invention for sale, how others have succeeded, and much more. You need this information.



Simple Inventions May Have Excellent Commercial Possibilities

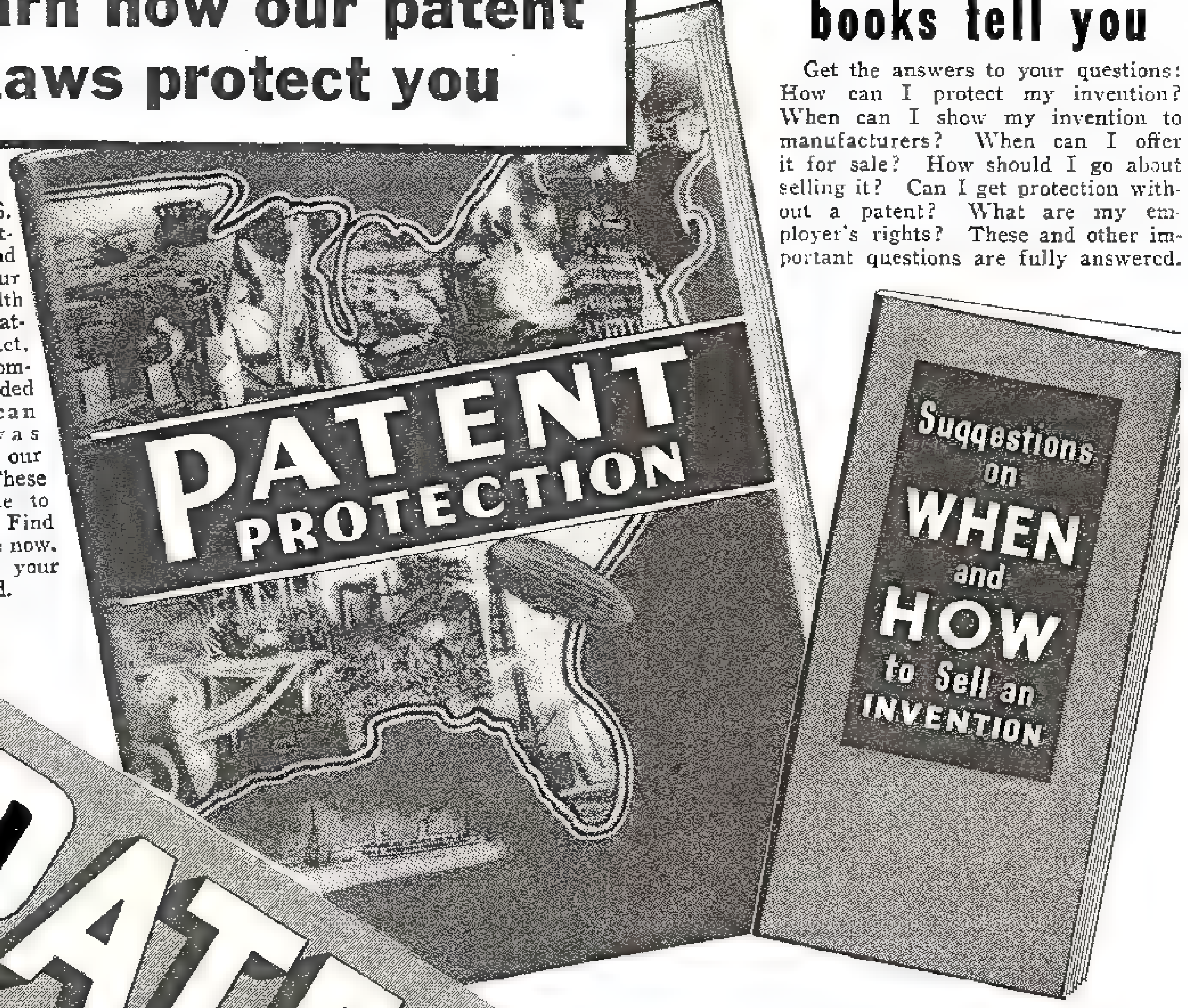
FREQUENTLY inventors confuse the size or the complication of a device with the question of commercial value and patentability. These two factors, of course, have no relation to each other. Most of our present-day complicated machines represent a process of evolution, a series of inventions. On the other hand, every so often some inventor comes along with a very simple "gadget" which possesses the elements of broad utility and is patentable. Some of the most profitable inventions have been of this latter class. Shown above are a few such examples. Whether a device is simple or complex, if it represents a forward step to save manufacturing costs, to save labor, or to add enjoyment to human life, it may prove patentable and profitable. This subject is more fully discussed in the booklet entitled "Patent Protection" shown on the opposite page.

What Will Be Next?

EVER since George Washington signed the first patent, America has led the world in inventions. It may be said that not a year has gone by without some important inventions being patented and commercialized. David Sarnoff, president of the Radio Corporation of America, sees a big future ahead for science and invention. Just as sure as the sunrise, 1937 will see new inventions come out—new wealth made from patents. Your idea may be one of them. You never can tell. For this reason you should send for our books today and get the facts about patents and inventions.

Learn how our patent laws protect you

The U. S. has liberal patent laws, and much of our national wealth is based on patents. In fact, a Japanese commission decided that American progress was mainly due to our patent laws. These laws are made to protect you. Find out about them now. This is for your own good.

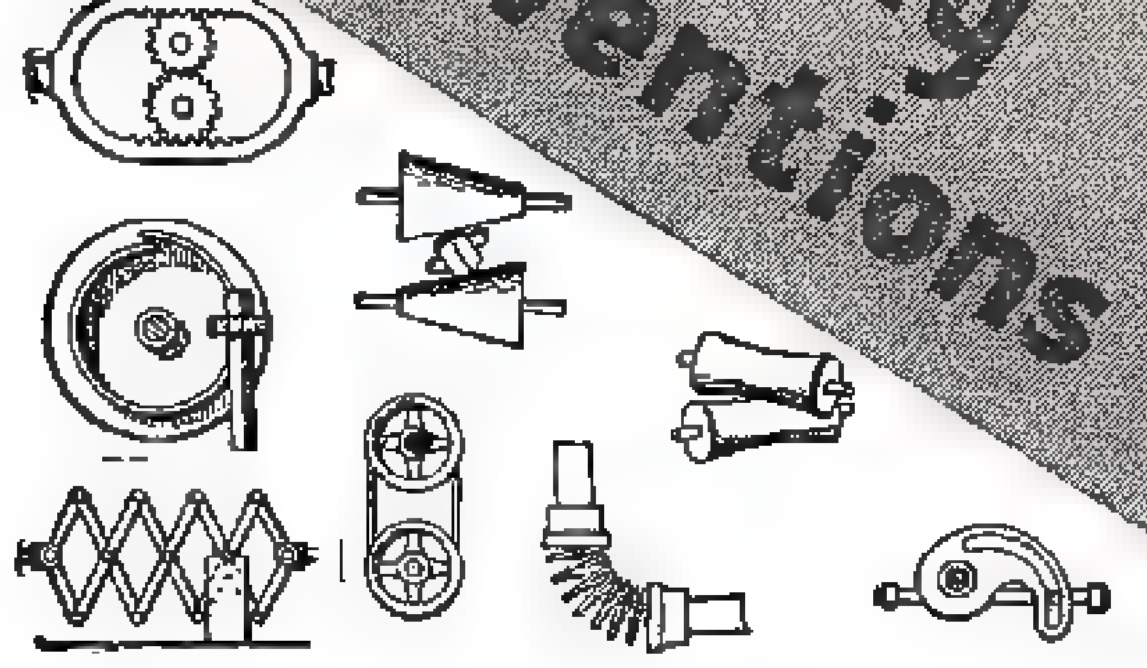

PATENT PROTECTION
Suggestions on WHEN and HOW to Sell an INVENTION

These FREE books tell you

Get the answers to your questions: How can I protect my invention? When can I show my invention to manufacturers? When can I offer it for sale? How should I go about selling it? Can I get protection without a patent? What are my employer's rights? These and other important questions are fully answered.

Mail Coupon Today

Delays are dangerous. If you have a good invention you should get protection for it just as soon as possible. Don't turn this page until you have clipped and mailed this coupon—you will hear from us by return mail.



115 Mechanical Principles Shown

Request the book "Patent Protection" (sent free to inventors). Not only does it tell you what to do for protection, and how to do it—it also shows you 115 different mechanical movements that you may use in developing your own inventions. Inventors tell us they have found these useful.

VICTOR J. EVANS & Co.

REGISTERED PATENT ATTORNEYS

MAIN OFFICE: 220-A, VICTOR BUILDING,
WASHINGTON, D. C.

Other Offices: 1007-B, Woolworth Bldg., New York; 1445-B, Monadnock Bldg., Chicago; 514-B, Empire Bldg., Pittsburgh; 1010-B, Hobart Bldg., San Francisco; 736-B, Security Bldg., Los Angeles.

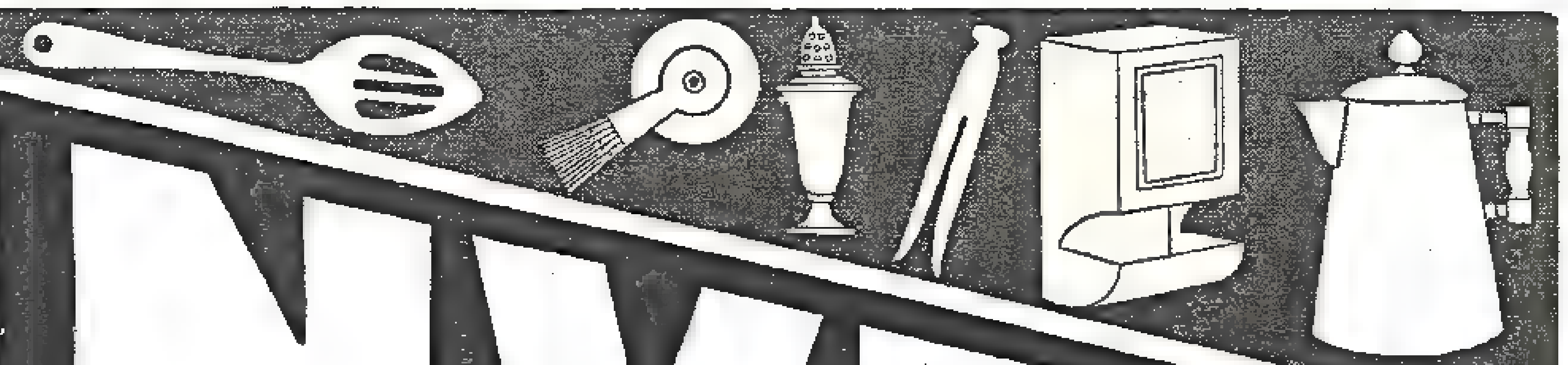
Send me FREE copies of your books, "Patent Protection" and "When and How to Sell an Invention." (Note: Same books supplied by any of branch offices listed above.)

Name ....

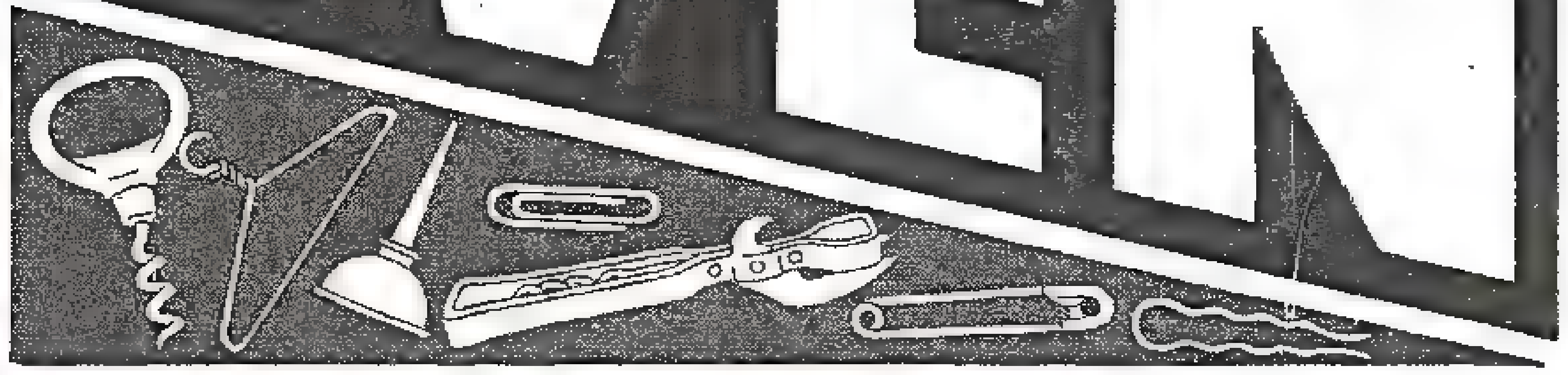
Street and No. ....

City or Town ....

INVENTORS

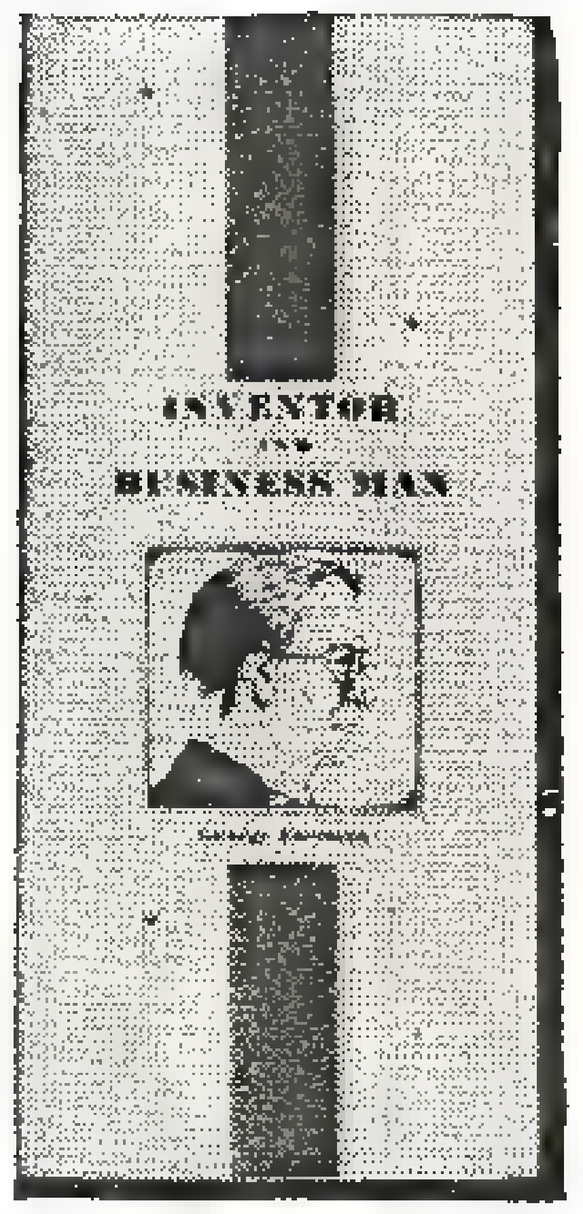


Small Inventions THAT HAVE BUILT BIG BUSINESSES



INVENTIONS do not have to be complicated to be profitable when Patented. The 5c and 10c stores flourish on simple Patented products which are commercially successful. The zipper, safety pin, thumb tack, paper clip, collar button—all simple, yet familiar inventions—brought their inventors rich rewards. If you have a Patentable invention—act to protect it. Many of the most useful, widely popular, greatly profitable, and extremely successful inventions have been very simple ones. You have only to look at the devices we have pictured here to realize how a simple invention may become a utility bought by a hundred thousand or a million people soon after it is produced. Don't be afraid that the simplicity of your invention makes it valueless. The thing that you find so simple that you wonder why a thousand other people haven't already done it is often the invention worthwhile.

HOW OTHER INVENTORS GOT STARTED



The list of men who succeeded in invention with only a poor boy's start is a very long and noble one. Poverty, hardships, lack of friends, distance from the market—these could not hold back Bell, Edison, Eastman, McCormick, Whitney and others. Everyone cannot succeed. But every man can try. Courage, sacrifice, and hard work may bring you a measure of the success these men had. Lack of mechanical ability is not a serious draw-back. You can always get someone able to build a model, draw a detailed design, or otherwise materialize your invention for you. The big draw-back is discouragement.

Your invention of a practical article or an improvement upon an old one should be patented NOW. Frequently many of the thousands of applications filed in the U. S. Patent Office each year are for the same or almost the same invention. In such a case, the burden of proof rests with the last application filed. Sometimes a delay of even a few days in filing the application means the total loss of the patent. LOSE NO TIME.

The entire time of this large and experienced organization is devoted exclusively to patent and trade-mark cases. We know the rules and requirements of the Patent Office. We understand the technicalities of Patent Law. We can proceed in the quickest and safest ways in preparing an application for a patent covering your invention.

FREE THE BIOGRAPHY OF GEORGE EASTMAN

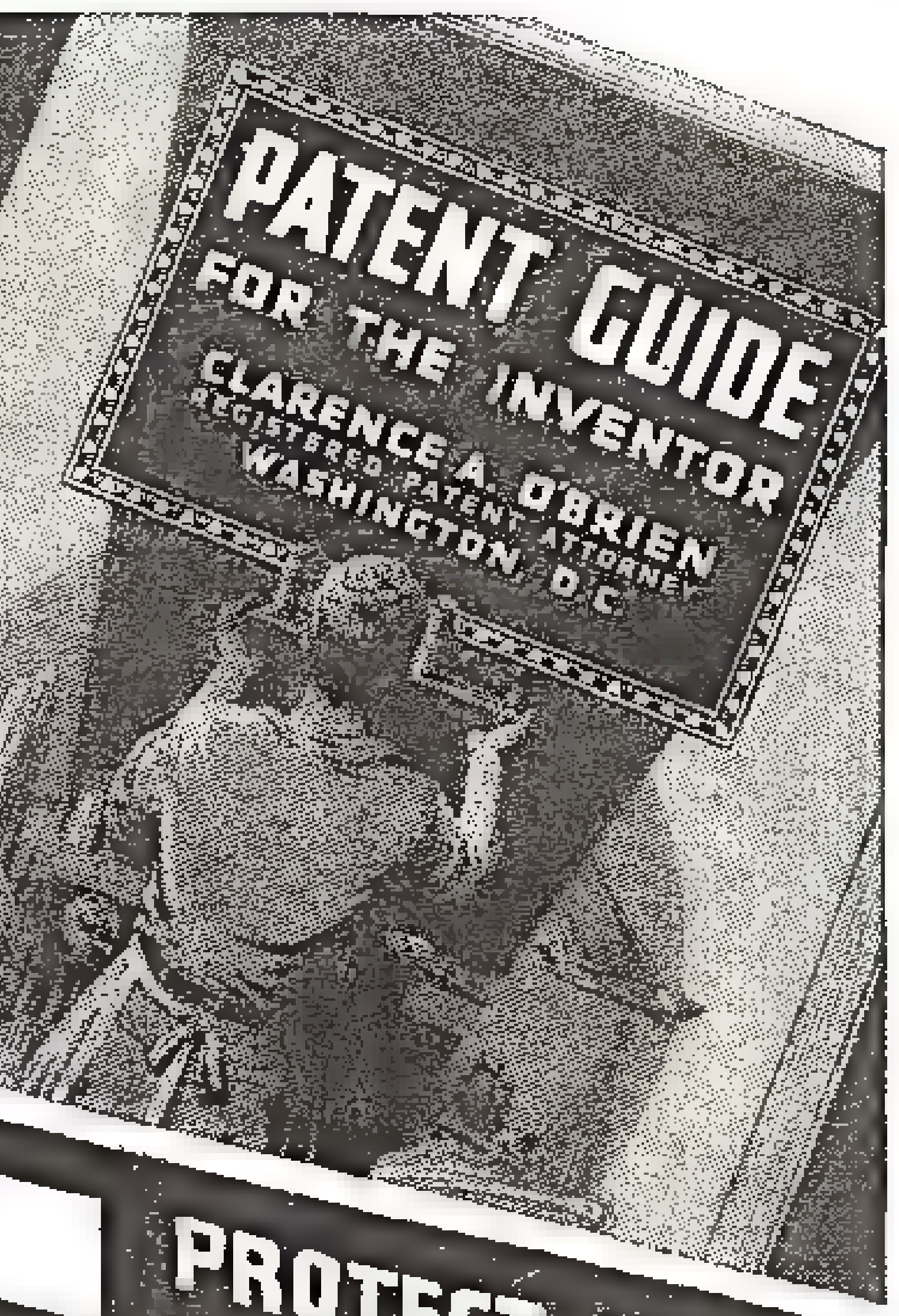
Views of the man who used Patent Protection to amass millions and give perfection to a new art—*Photography*—itself one of the greatest inventions.

CLARENCE A. O'BRIEN & HYMAN BERMAN

317-S ADAMS BUILDING **WASHINGTON, D. C.**

Registered Patent Attorneys Before U. S. Patent Office

Send For This FREE BOOK



PROTECT YOUR INVENTIONS WITH U.S. PATENTS

If you have an invention that is patentable—and want to secure for yourself your inventor's sole right to profit from the invention—you can't afford to lose time in securing the protection of a U. S. Patent. Other inventors may be working on the same invention right now. Should they develop this invention and file patent application before you do—the burden of establishing priority will be upon you. Our Big Book—"Patent Guide for the Inventor"—will tell you the quickest possible way to secure Patent Protection for your invention. SEND FOR IT TODAY!

The First Important Step in Securing a Patent

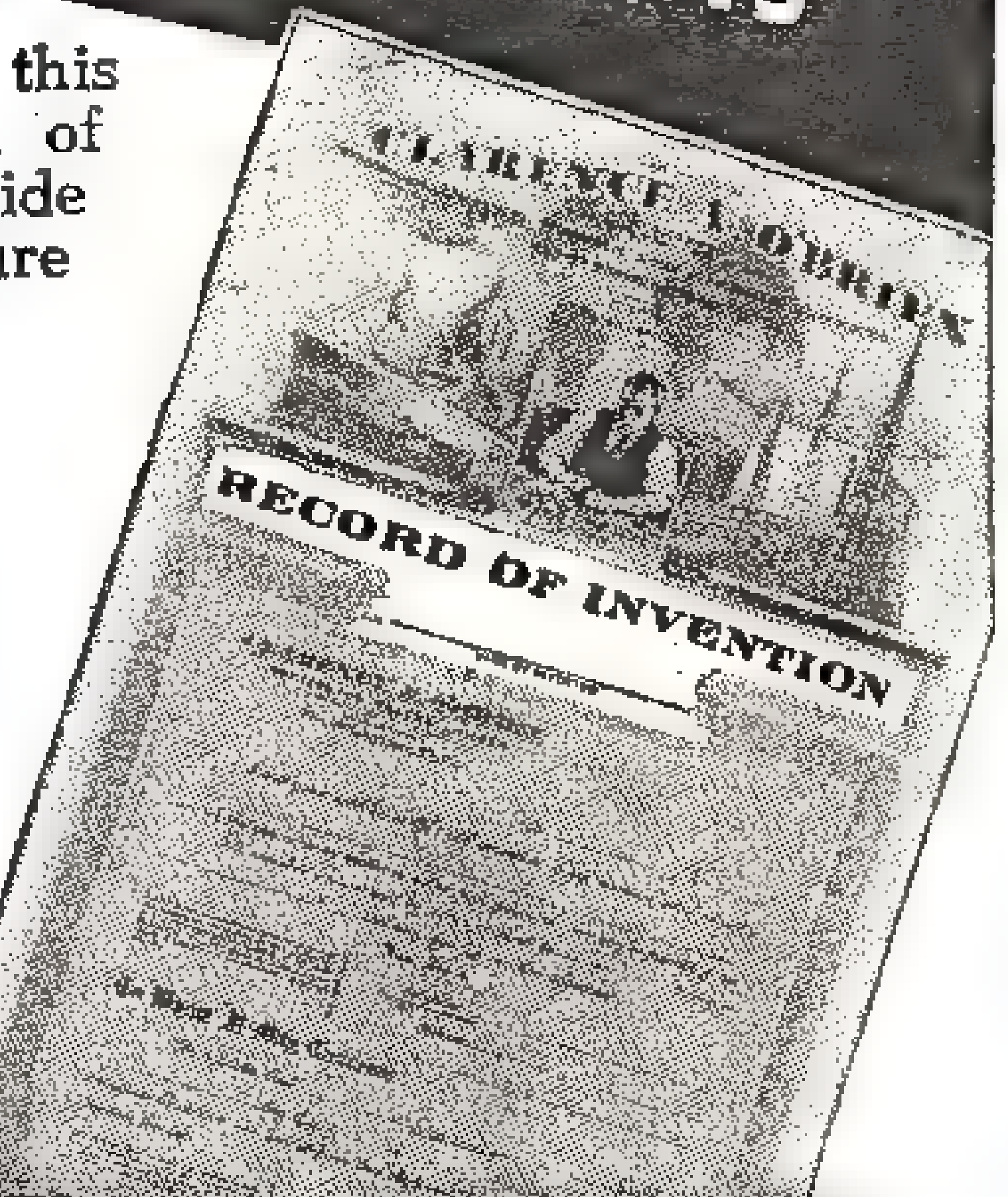
is to obtain the services of a Registered Patent Attorney. The U. S. Patent Office advises that you secure the aid of an experienced Registered Patent Attorney to prepare your statements. Establish the date of your invention as explained in our book and disclose your invention to him in correct form. He then makes a SEARCH of the Patent Office Records and reports to you on existing U. S. Patents which might bear on your invention, giving his opinion on the advisability of proceeding and filing formal application.

Reasonable Fees—Convenient Terms

Don't worry about finances. Our fees are very reasonable—we can arrange convenient terms of payment. It is our custom to permit clients to pay for our services in installments as the application progresses in our office. See our Big Book for fees in obtaining Patent. It explains our arrangements clearly. Send for it NOW!

FREE RECORD OF INVENTION FORM

Use our Free "Record of Invention" form to assist you in recording the descriptive outline of your inventions and to establish the date of your invention. With it you can make a rough sketch of your invention and have it witnessed in a manner of value to you as evidence should occasion arise.



CLARENCE A. O'BRIEN
& HYMAN BERMAN
317-S ADAMS BUILDING
WASHINGTON, D.C.
REGISTERED PATENT ATTORNEYS
BEFORE U.S. PATENT OFFICE

Please send me at once your Big Free 48-Page Book, "Patent Guide for the Inventor" and your Specially Prepared "Record of Invention" form. Also George Eastman Biography, "Inventor and Business Man." This request does not obligate me.

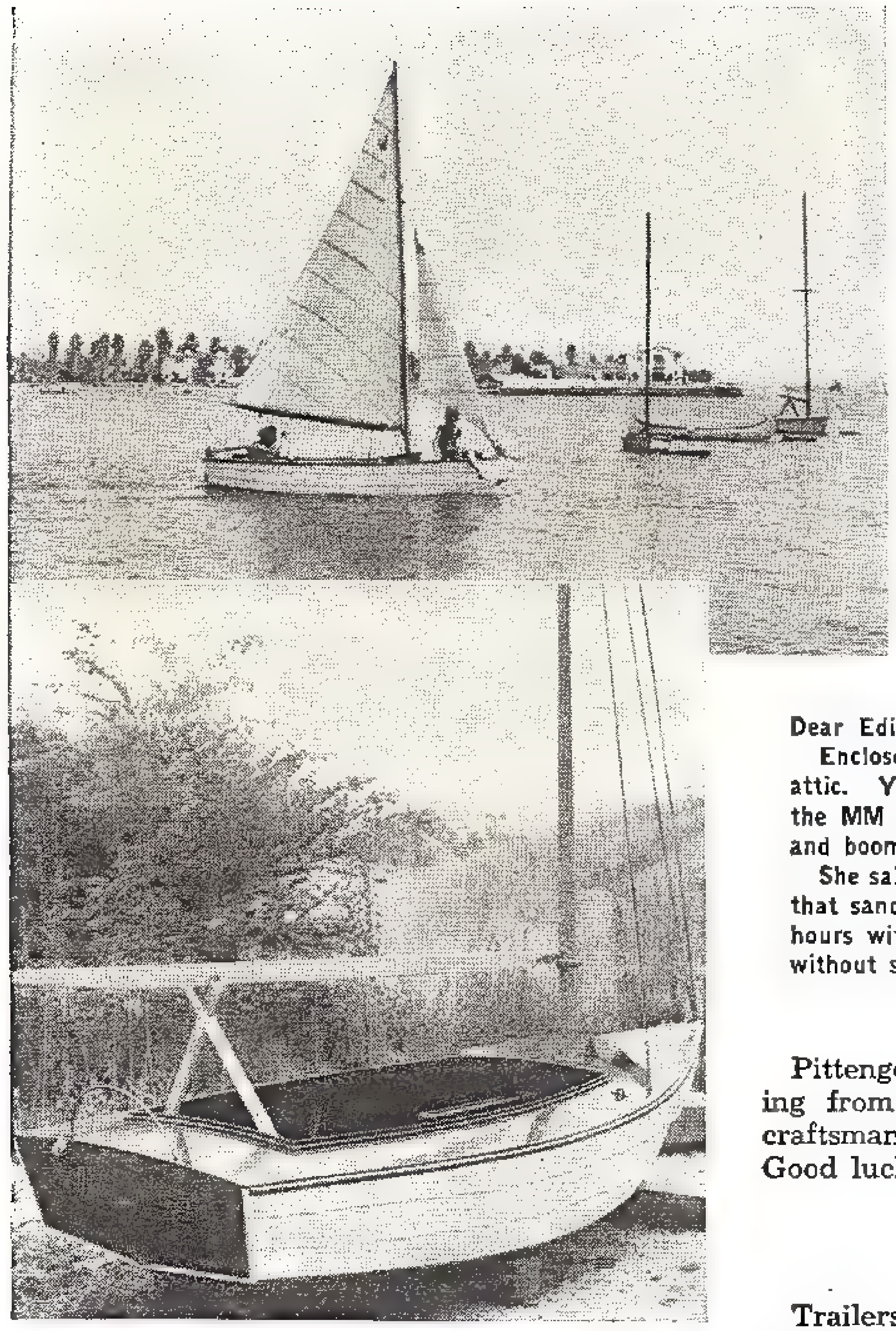
NAME ....

ADDRESS ....

....

(*Please write or print plainly*)

Random Chips from the Editor's Workbench



Top—A. D. Pittenger, of Los Angeles, Calif., takes a friend for a sail in NOMAD, a boat built from MM plans. It carries four people. Bottom—Close-up showing construction.

THE mailbag was pretty heavy this month and letters and photos describing many interesting projects completed by MM readers indicate that home workshops are gaining in popularity. From workshops with limited space and a few good tools to spacious shops equipped with lathes, many tools, and other mechanical aids, MM readers are turning out projects of every type and description. Most of them are built from plans that appeared in past issues of MM publications.

***

Talking about making things, don't overlook the new 1937 edition of the MM Handy Man's Home Manual that is now on sale at your local newsstand at 50 cents per copy. If your newsdealer has run out of copies, order one direct from MM at Greenwich, Conn.

Presenting many practical kinks, plans, and detailed instructions for many projects, the manual will be a welcome addition to the library of any workshop fan. Its 144 pages feature over 800 illustrations.

***

First prize of $5 cash for the most interesting project photo received this month goes to A. D. Pittenger, of Los Angeles, Calif. He says:

Los Angeles, Calif.

Dear Editor:

Enclosed are photos of NOMAD which I built in my attic. You can see from the photos that I followed the MM plans very closely, even to the hollow mast and boom, although I changed the cockpit a bit.

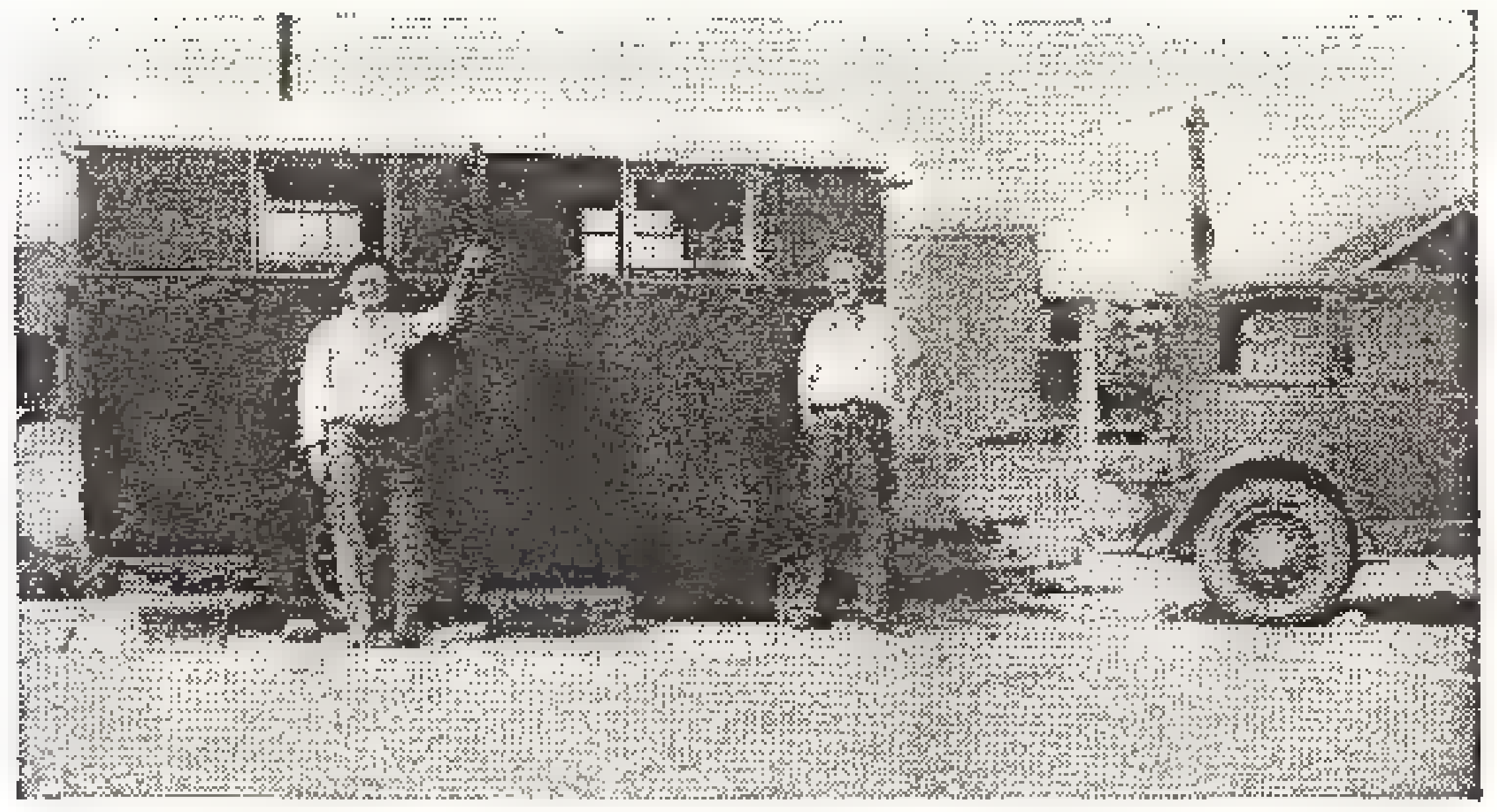
She sails nicely and I have had her in a blow so hard that sand was flying on the beach. I have sailed for hours with four aboard and have hit some big waves without shipping any water.

A. D. Pittenger.

Pittenger's boat certainly is a beauty and judging from the close-up of the craft, it entails craftsmanship of which he may well be proud. Good luck, Pittenger.

***

Trailers are becoming more numerous and MM readers are quick to show their skill at constructing them as the following letter proves:



A real home on wheels is this trailer built by Howard R. Goldy, of Camden, N. J. Its four bunks, stove, radio, sink, and other household articles insure comfortable traveling.

Camden, N. J.

Dear Editor:

I am sending you a photo of my trailer. It is 12 feet long and has a chassis similar to the one used by Sir Guy Standing in the MM "How To Build It" book.

Inside the trailer are four bunks, stove, refrigerator, closet, sink, and a home-built five tube radio. I have the MM article describing the CRUISEMITE trailer and would like to make my next trailer like it.

Howard R. Goldy.

Mr. Goldy was awarded a prize of $3 for his trailer photo and letter. He certainly has turned out a creditable trailer and we know he will encounter no trouble in building CRUISEMITE.

***

Midget cars are still a heavy favorite with MM craftsmen and hardly a mail fails to bring several photos of trim little speedsters. A $3 prize was sent to Homer Groce, of Clemson, S. C., who says:

Clemson, S. C.

Dear Editor:

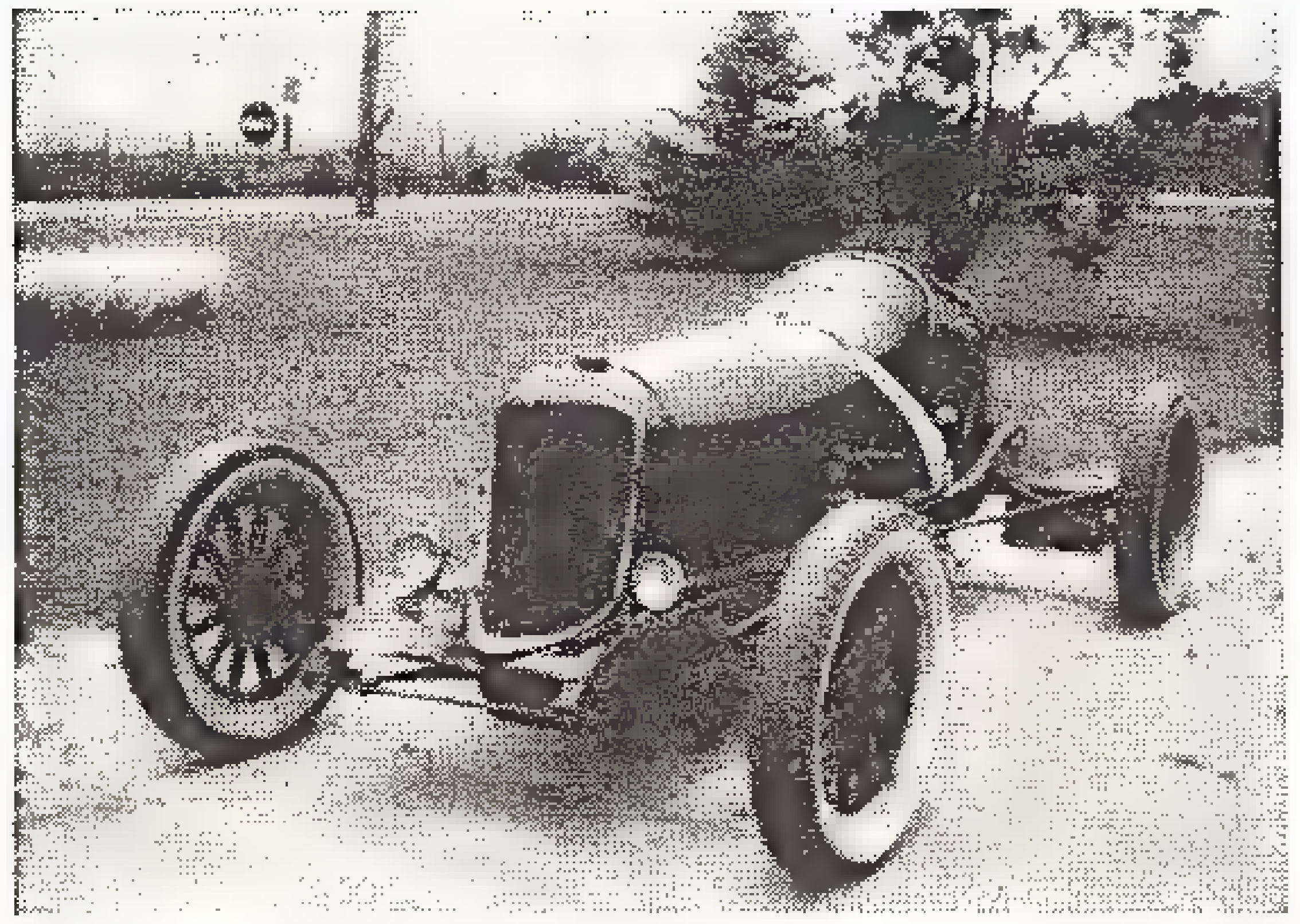
I am enclosing a photo of a car I built. It has a model A Ford motor hooked up to a model T Ford rear-end.

Cooling is accomplished by two radiators, cut down, and placed one in front of the other. I get 28 miles per gallon with the car and it is capable of doing 80 m.p.h. I will gladly answer any questions from MM readers if they include a stamped, return envelope with their inquiries.

Homer Groce.

Here's a chance to get first hand information about a real snappy looking racer. You can reach Mr. Groce at Clemson College, Clemson, S. C.

***



Featuring a double radiator cooling system, this midget racer attains a speed of 80 m.p.h. and travels 28 miles on a gallon of gasoline. It was built by Homer Groce, of Clemson, S. C.

A pleasant sight to the eyes of boat lovers is this trim looking sailboat built from MM plans. BUDDY, as the boat is known, was built in little over a year by Neil Hoyt, of Detroit, Mich.

Boats and more boats. All good ones, too. No matter how many workshop letters the editor receives, the number of boat letters and photos far outnumbers the others. Our only regret is that we cannot print more of the letters, but space is limited.

From Detroit, Mich., comes a letter and photo that secured a $3 prize for its writer.

Detroit, Mich.

Dear Editor:

Here is a picture of BUDDY, built from plans in the MM book—"How To Build 20 Boats." I am very proud of her as she is the first boat I ever built. It cost about $250 and required a year and three months to build.

I am putting outside ballast on the keel this winter as I use her on the Great Lakes. I'll be glad to give any information to MM readers who may wish to build BUDDY.

Neil Hoyt.

We sure envy Mr. Hoyt. He'll be able to make some excellent cruises in BUDDY. He has reason to be proud of her for she is a trim craft and pleasing to the eye.

***

Winter weather always spurs the snow-sled fans and they don't forget to send photos to their

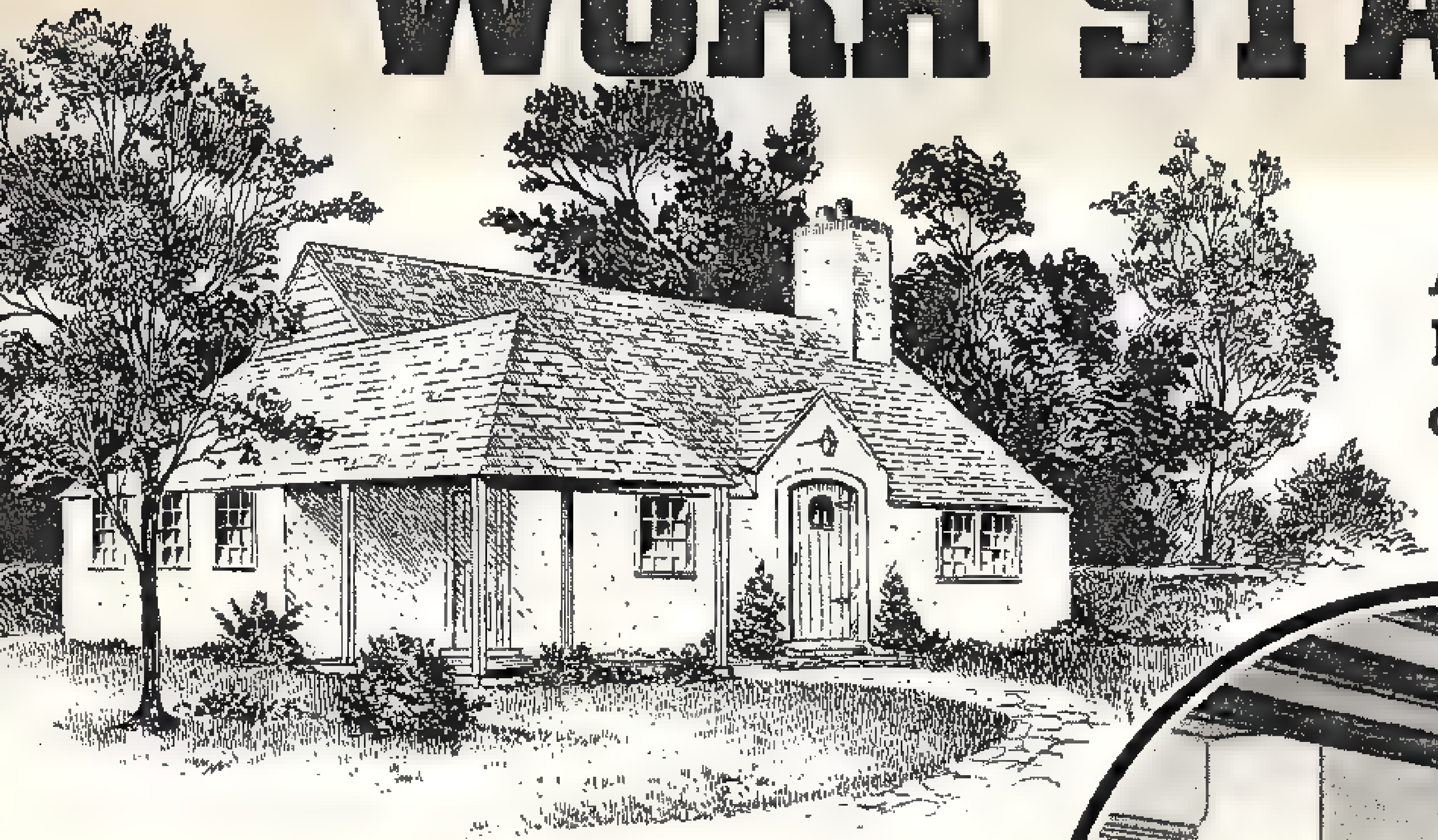
[*Continued on page 26*]

WORK STARTS on MM HOME

Architect helps builder obtain best for money.

by Wesley Sherwood Bessell

New York Architect



This attractive $3,500 model residence is being constructed by Modern Mechanix in Leonia, N. J., five minutes' drive from the George Washington Bridge over Hudson River. It will demonstrate the ease with which the average man can finance and build his home.

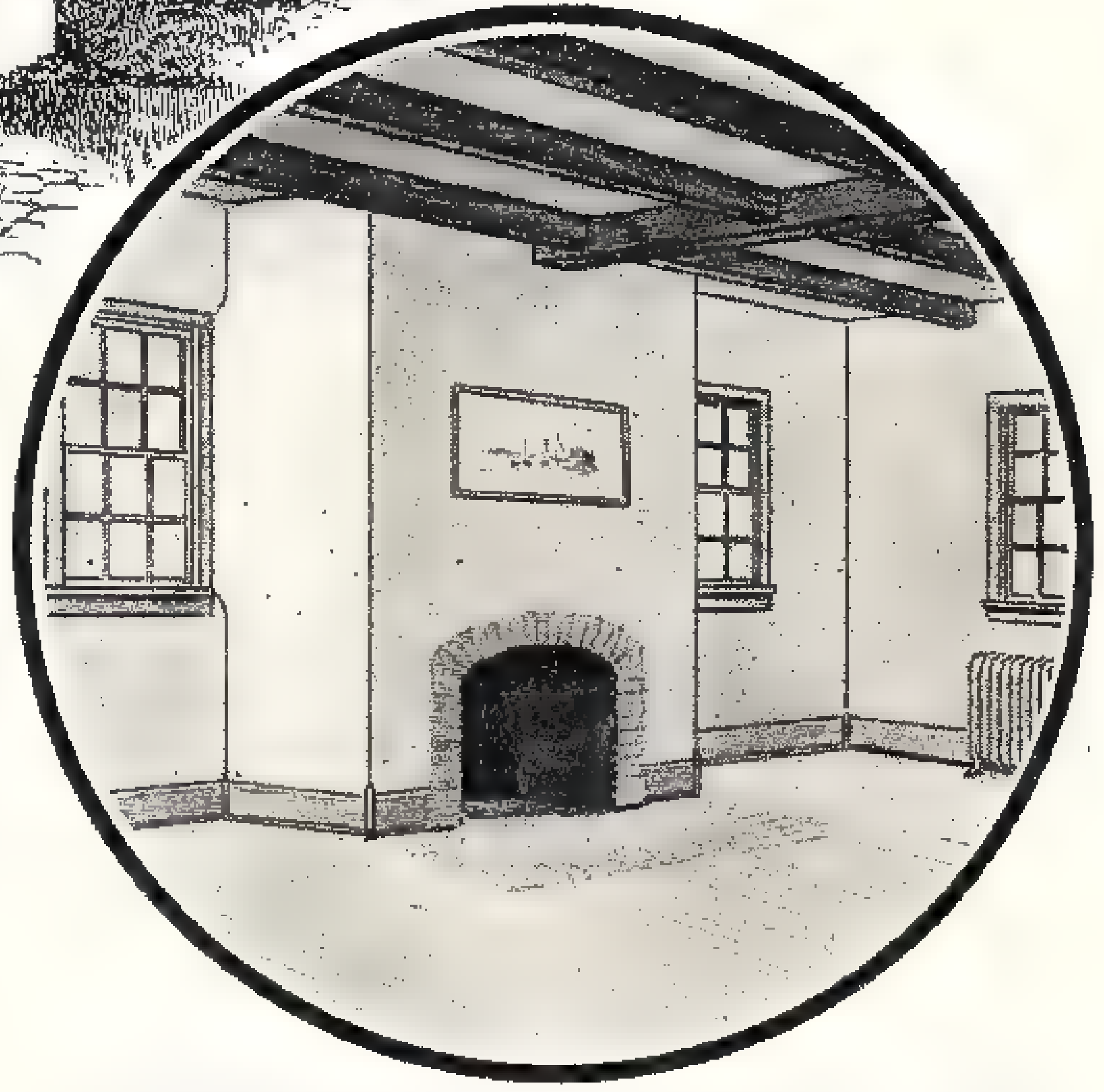
CONVINCED of the ease of building their own homes, Tom and Jim and their wives purchased their building lots. Now spread before them were the blueprints—the plans of dreams which a short while before seemed impossible. Yet they were fast coming true.

Jim had a small grocery store, $3,000 in savings and two children for whom he was doing his best in a crowded city flat. Tom, on the other hand, was a clerk earning $1,200 a year. After many years of strict economy he and Mary had managed to save $1,600. Jim liked to find his recreation puttering about in a home workshop; Tom was an amateur photographer, with a passion for doing his own dark-room work. Their city flats did not afford room for their hobbies.

They were discussing these one day when Bill Johnson, who worked in an architect's office, showed them how his Boss could help them build their own homes which could be paid for at a cost cheaper than rent.

Tom's home—a one-story, four-room house to be built at a cost of $3,500 in Leonia, N. J., a few minutes from the George Washington Bridge that connects New York and New Jersey—has been selected as a model home by this magazine, and construction is under way.

Tom learned that with $1,230 in cash—including $600 for his lot—he could secure a loan of the additional $2,870 necessary from an independent building and loan association or one connected with the Federal Home Loan Bank or the Federal Housing Administration. The loan, payable at $29 a month, must be paid back in ten years.



Specifications for the home call for a brick wood-burning fireplace in addition to a steam heating system designed to maintain an even temperature of seventy degrees even in sub-zero weather.

Jim, because of his two children, required a bigger house. His two-story, five-room home will cost $5,500. Of this amount he has $1,890 cash, and must seek a loan of $4,410, which he must pay back at the rate of $45 a month for the next ten years.

Since the day they decided they could afford to build their homes things had been moving rapidly. Everything was ready now to submit to the contractors.

The blueprints of plans and elevations of both houses, with specifications fully explaining just what must be built into the homes and how to do it, included all the suggestions that Tom, Jim and their wives had made.

All the ideas that they desired in a home were carefully worked out. The plans were drawn up to a scale of one-quarter inch to the foot, and were similar to the original smaller sketches but with such changes as they had carefully discussed. It was agreed that requests for estimates be made at once.

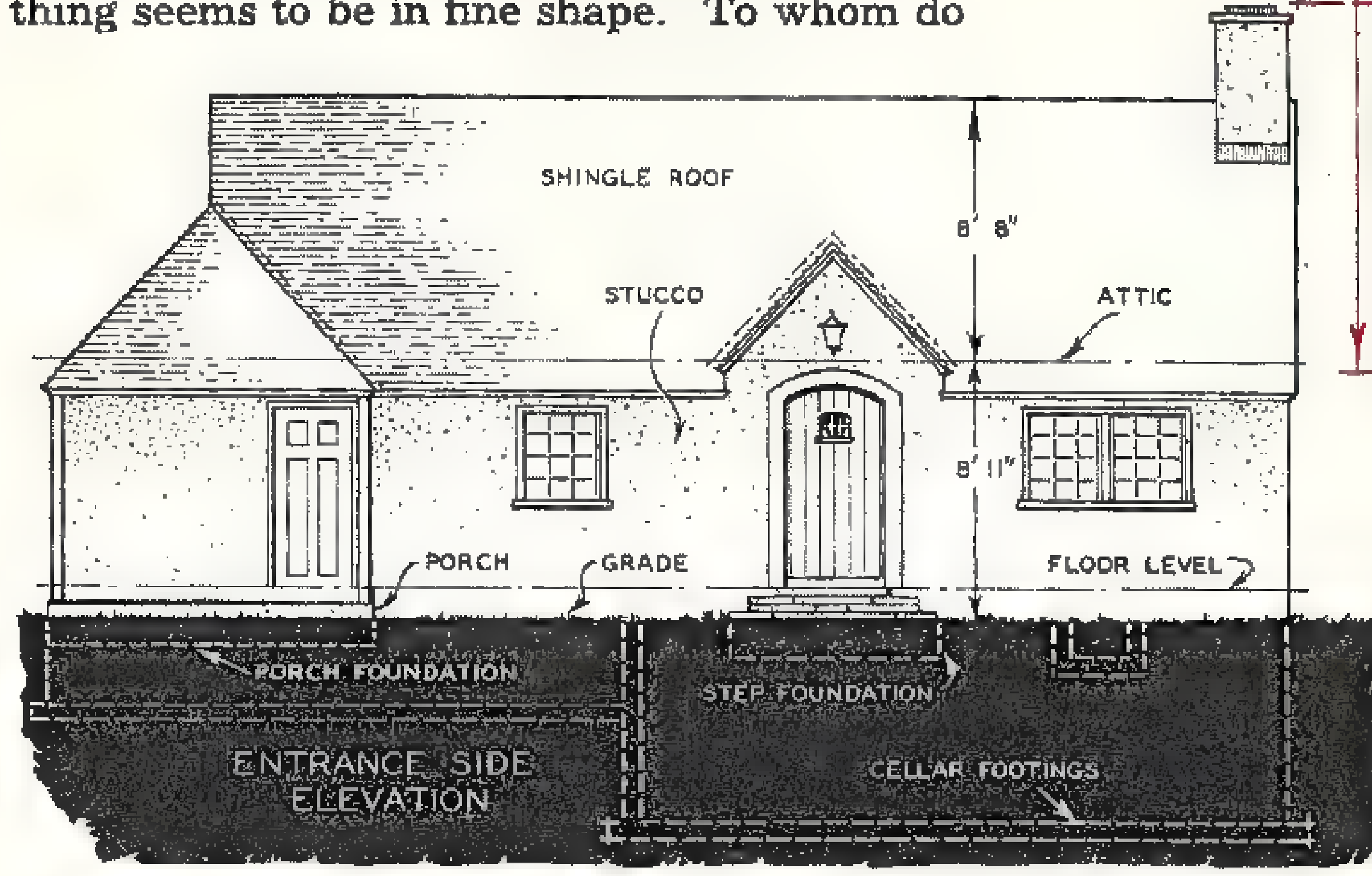
"But what if the figures run more than our allowances?" asked Tom.

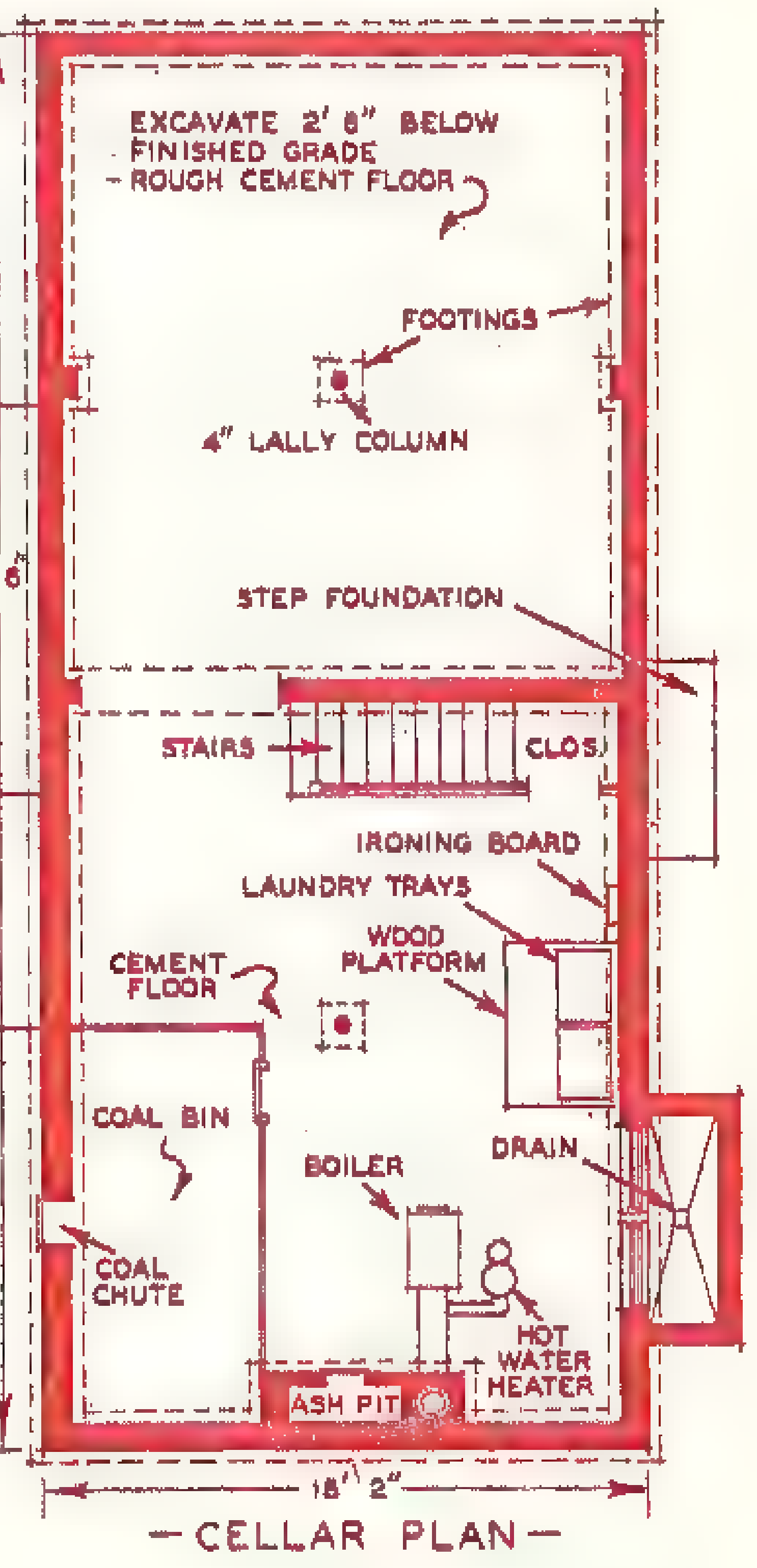
"In that case," Bill answered, "we usually call in the two lowest bidders and suggest that certain modifications be made in the plans and specifications whereby the cost can be brought within the allowed amount. Or, if necessary, we make up an entirely new set of plans and specifications cutting the room sizes and thereby reducing the cubage, together with other changes, and send these plans out for new estimates."

He went on to explain that the architect usually assumes the responsibility for the second set of plans, and that there is no charge for the additional work. He added that an architect endeavors to obtain as much for his client as he can, including the best and latest improvements. If all these come within the allowance, so much the better, but if figures are higher, he pointed out, he knows of savings he can suggest to the builder.

"Well," said Tom, enthusiastically, "everything seems to be in fine shape. To whom do

Wesley Sherwood Bessell, the author, is well known for the homes, schools and postoffices designed by him in recent years in Long Island and New Jersey.



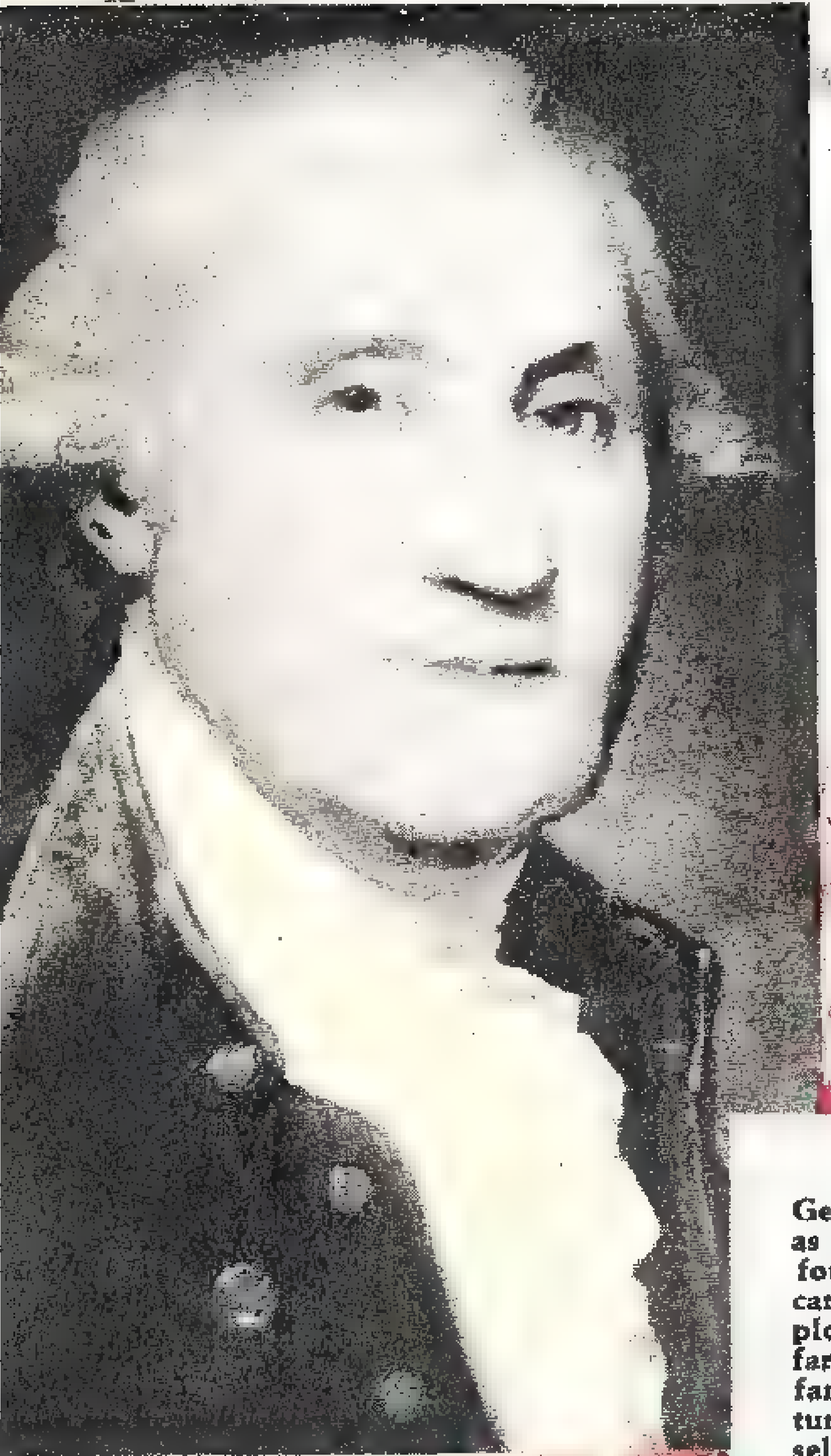


—CELLAR PLAN—

These drawings show basement and foundation plans for the home. Concrete blocks will be used for the foundation walls. Basement walls will be made watertight by cement mortar inside and outside.

GREAT INVENTIONS of FAMOUS MEN

by Aubrey D. McFadyen



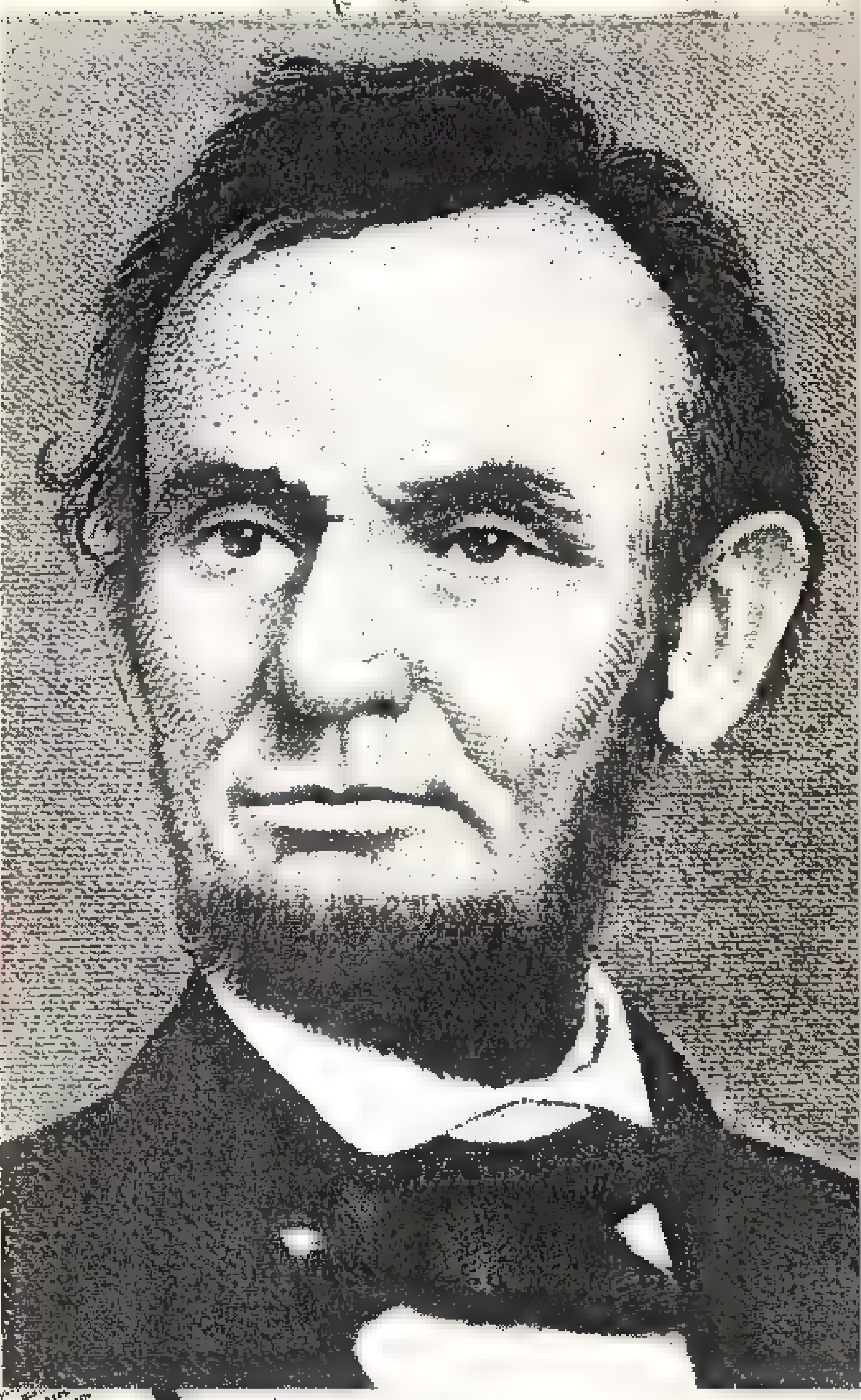
SENATOR WILLIAM G. McADOO'S fingers were burned at a picnic when he picked up a metal thermos bottle cap-cup full of hot coffee. So he went home and invented a heat-proof cap. The Senator's latest patent covers improvements in the familiar safety razor—the new razor being constructed so that the blade can be inserted or removed without taking the razor apart.

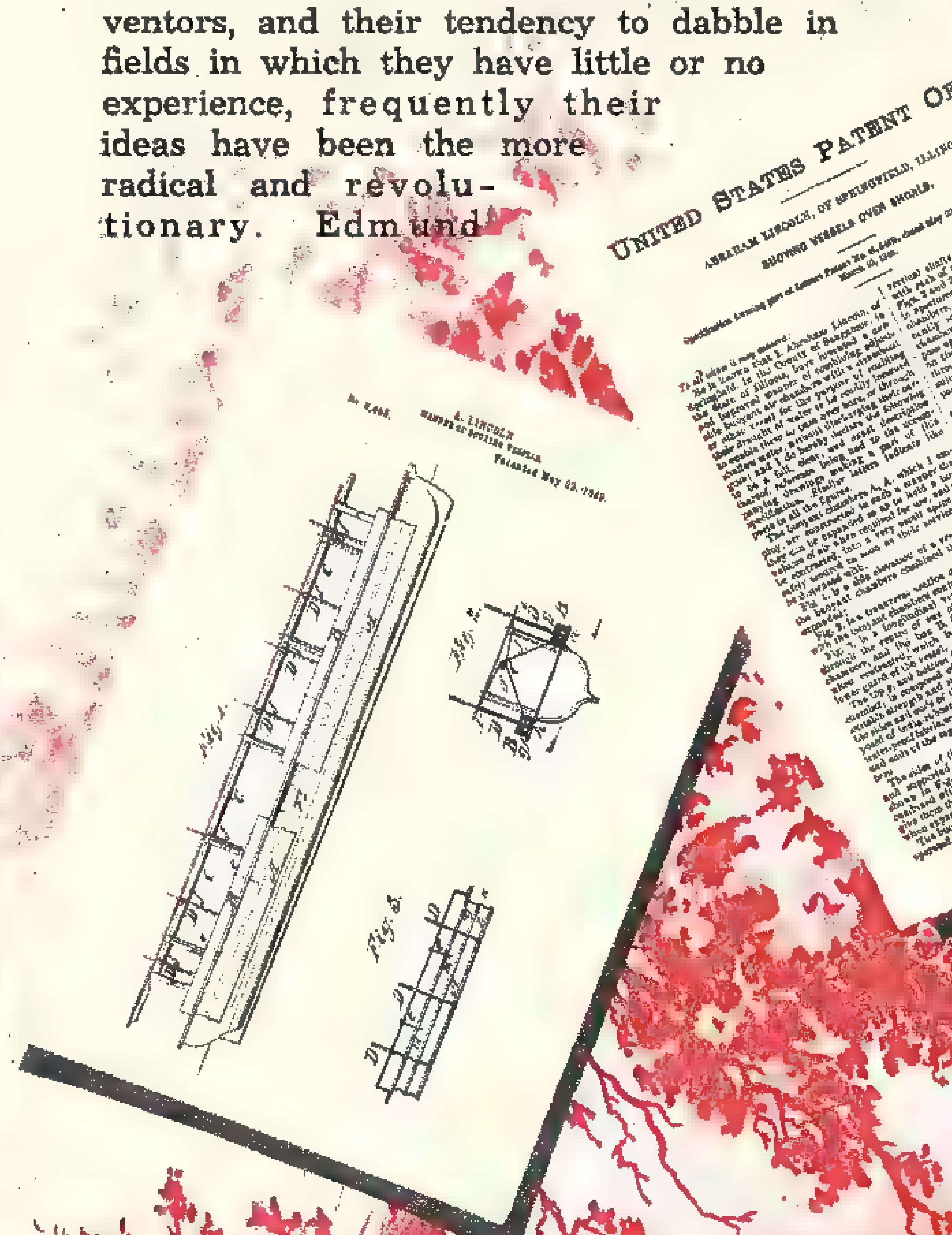
To such casual inventors the world is indebted for most of the 2,059,187 inventions patented in the United States during the 100 years existence of the American patent system, the centennial of which was observed in Washington on November 23.

Everybody, from Presidents to prisoners, has been inventing all manners of things. It excites little wonder when an eminent pianist patents numerous automobile structure, or when a pugilist patents a monkey wrench, or even when a scion of one of the nation's wealthiest families patents a shoe polishing device. The name of Dr. Albert Einstein is so much in the daily print in connection with his theory of relativity that when he patents a novel refrigerating system it is not even regarded as news.

When one reads that Thomas A. Edison patented 1,101 inventions, that John F. O'Connor, Chicago railway engineer has patented 968, or that Carleton Ellis, Montclair, N. J., chemist, has patented nearly 700 inventions ,the conclusion is immediately drawn that professional inventors are the backbone of the Patent Office. Nothing is farther from the truth. Men like John F. O'Connor, Elihu Thomson, Carleton Ellis, Henry A. Wise Wood, Clyde C. Farmer, John Hays Hammond, Jr., and Ethan I. Dodds—all living inventors, each having patented over 300 inventions—are the exceptions. For every professional inventor there are hundreds of amateur or casual inventors. In fact, by reason of the inexperience of the casual inventors, and their tendency to dabble in fields in which they have little or no experience, frequently their ideas have been the more radical and revolutionary. Edmund

George Washington, pictured as painted by Gilbert Stuart, found time in his versatile career to invent a seeding plow, a wine coaster and other farm devices. Samuel Clemens, famed as Mark Twain, pictured at right. invented the self-pasting scrapbook which can still be purchased at stationery stores. The illustration is from his patent. He also invented an adjustable strap for the backs of waistcoats and trousers.





UNITED STATES PATENT OFFICE

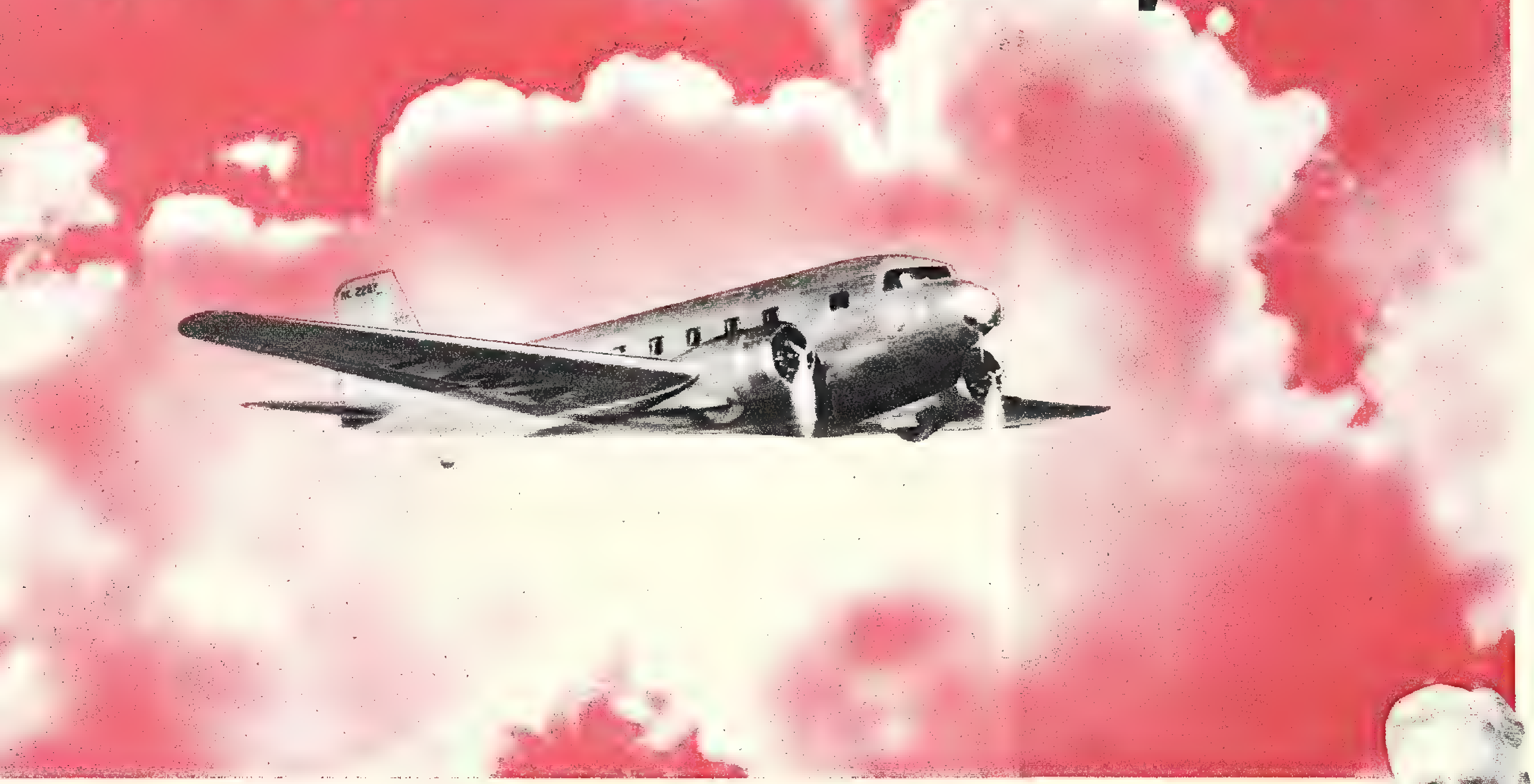
ABRAHAM LINCOLN, OF SPRINGFIELD, ILLINOIS.

BUOYING VESSELS OVER SHOALS.

A. LINCOLN
Patented May 22, 1849
Fig. 1
Fig. 2
Fig. 3

Abraham Lincoln, famed for far different things, in 1849 invented and patented a system of buoyant chambers designed to help boats clear shoals in the Ohio and Mississippi Rivers. He was inspired by the difficulties of navigators which he witnessed in the course of a flatboat trip to New Orleans. A model is preserved in the Patent Office.

AROUND the WORLD By AIR



by H. R. Ekins

First Man to Circle Globe Via Air Lines

IT TOOK a flight around the world, entirely by air, to bring home to me the tremendous strides made by commercial aviation in the last ten years. For me the journey of little more than 18½ days, during which I flew a route of approximately 26,000 miles, was a study in aviation as it is today compared to what it was only a few years ago.

On my journey I used eight aircraft in all. The first was the German dirigible Hindenburg, the latest development in the science of lighter-than-air craft. The designers, builders and operators of the Hindenburg expect, however, that soon it will be surpassed by new giant ships of the air.

The other seven aircraft were of the heavier-than-air type. Three were used in the United States. They were twin-motored Boeings of the United Airlines and Douglas DC-2's of TWA—Transcontinental and Western Airways. The three planes which took me all the way from Frankfort, Germany, to Manila were made by Douglas, and the long trans-Pacific hop was aboard Pan-American Airways' "Hawaii Clipper," the big four-motored flying boat built by Martin and powered by Pratt and Whitney.

The aircraft listed above are the most modern and most efficient available to the civilian traveler. The study in contrasts, insofar as airplanes were concerned, began at Frankfort when I boarded a big Douglas airplane operated by KLM—Royal Dutch Airlines.

Six years ago, when I was flying around the Far East as a war correspondent for the United Press, the most powerful of the air-cooled radial engines of the Wright Cyclone type, were rated at about 525 horsepower. In 1930 it was believed, on the basis of experience and research with the material then available, that it would be decidedly impractical to build an engine rated at more than 600 horsepower and still maintain even a vestige of dependability. Dependability in those days meant an engine that would operate for 250 hours between routine overhauls. By 1931 the power of the Wright Cyclone was increased to 575 horsepower by using slightly larger cylinders to obtain increased cubic inch displacement. During the same year advances in metallurgy and knowledge led engineers to believe that they had underestimated the possibilities of engines of the radial type.

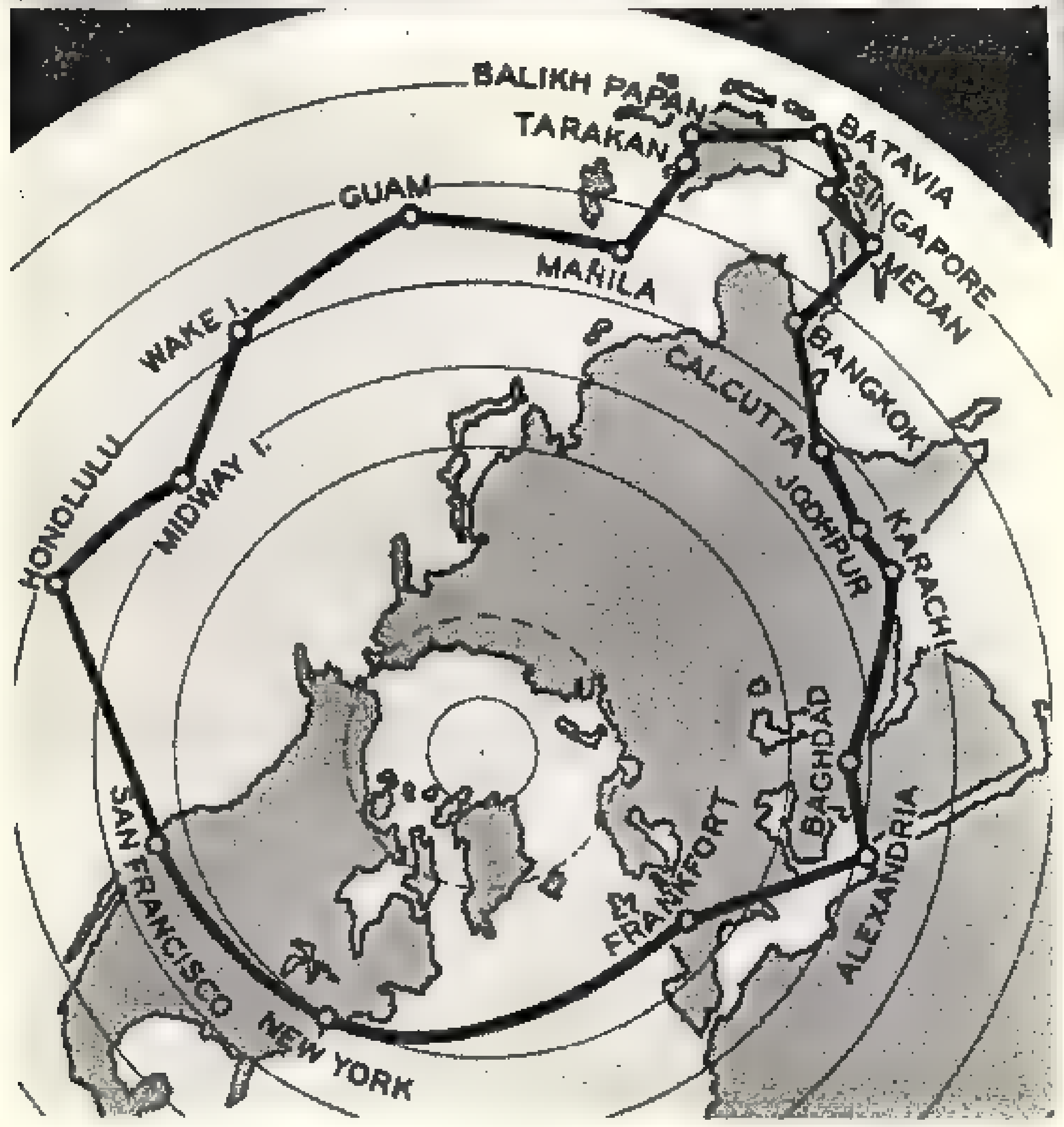
To jump a bit to the advances which had been made by the time I was ready to take off from Frankfort for the Orient I should like to point out the following:

All the way from Frankfort, Germany, to Batavia, Java, flying in only two planes, I flew behind 890 horsepower F-50 Cyclone engines. The plane of the Royal Netherlands-Indies Airways, which took me from Batavia, Java, to Manila, was powered with 715-horsepower Cyclones. When TWA flew me across the continent on the last leg of the journey they used a Douglas plane,

Above—The TWA Douglas transport plane that carried Ekins part way on his round-the-globe dash. Right—Ekins being congratulated by Miss F. W. Wilkins, TWA plane hostess, upon completing his race at Newark, N. J. Below—Dutch (K-L-M) Airline Douglas transports carried Ekins from Frankfort, Germany, to Batavia, Java.

KONINKLYKE LUCHTVAART MAATSCHAPPY
PH-AKK

Above—The German airship, Hindenburg, over N. Y. City. Ekins started his now famous trip from Lakehurst, N. J., aboard the giant dirigible on Sept. 30. Little more than 18½ days later, he circled Lakehurst in a TWA transport plane on route to Newark, N. J., having girdled the globe.



The route followed by Ekins on his record making flight, using only commercial airlines, is graphically shown above. The safety and comfort of American airplanes was Ekins' outstanding impression of the flight.

the Sky Chief. It was powered with F-50 Cyclones of an 890-horsepower rating.

The series F engines go back to 1932 when the Wright Aeronautical Corporation announced the development of engines rated at 700 horsepower at sea level. They weighed only two-tenths of a pound per horsepower more than the one pound per horsepower weight which the late Thomas A. Edison said was ideal for an aircraft engine. The success of the Cyclone F was immediate.

Its first commercial application was in the fleet of Douglas Airliners with which TWA equipped itself in 1934. The American and Eastern Airlines followed suit. Strangely enough, most of this I learned while flying with Dutch pilots across Europe, the Near East, and India to the Far East.

While flying over scorched, monotonous deserts I learned that in 1934 the leaders of Dutch commercial aviation were following developments in America closely. KLM negotiated with TWA to purchase one of its ships. TWA had the Douglas production tied up with priority rights.

The Dutch got their ship. Cyclone powered, it was used by two KLM pilots, Parmentier and Moll, in the McRobertson London-to-Australia air derby that involved 12,000 miles of flying. They took second place in the speed race and first place in the handicap division. By the time the race was over KLM had ordered a fleet of Douglas planes, all powered with Wright Cyclones.

The performances of Cyclones in Douglas airplanes used to establish records both in this country and abroad caused the Douglas Company to standardize on the Wright Cyclone engine for airliner installation. Of more than 150 Douglas airliners now in use only one, I believe, is powered with other than the standard engine.

It was the dependability of airplane engines that impressed me most as I flew around the world. I was actually in the air 8 days, 10 hours and 26 minutes, and to a man anxious to get home swiftly, yet safely, the matter of dependability was of utmost importance.

The motors behind which I flew in my early days as a passenger in airplanes would run dependably for only about 250 hours before overhaul. Now they will run at least 400 hours. Dutch engineers, great enthusiasts for American airplane power plants, told me that operation of 700 hours without overhaul is possible.

Several developments, I found as I flew, are responsible for the high efficiency of the mechanical facilities which enabled me to get around the world as fast as I did. They included the dynamic damper, a patented development removing all vibration from the engine. There were also improvements in cylinder head designs and better cooling which marked an important step towards increased power. In this connection we can look forward to further advances in supercharging which will allow greater power,

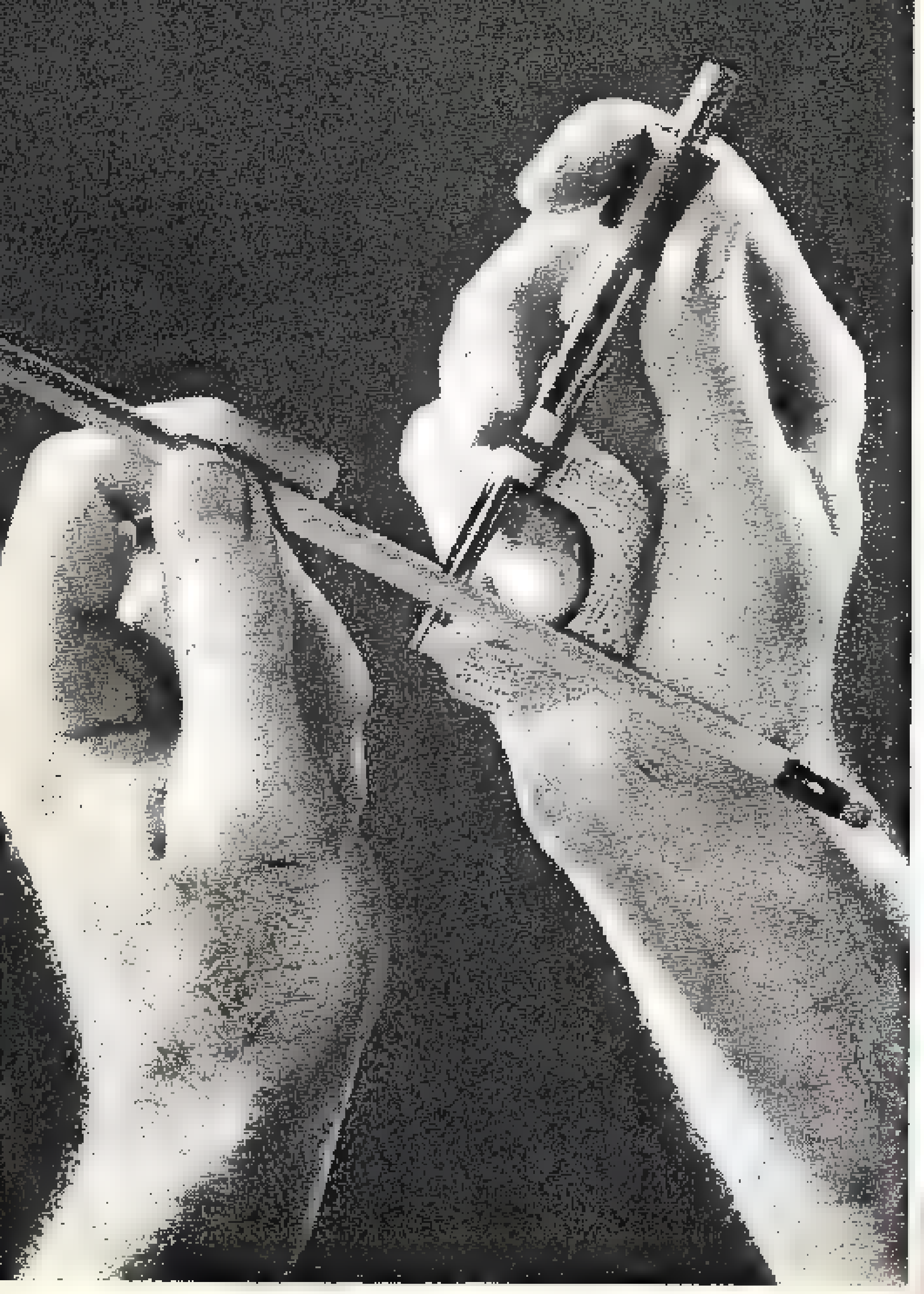
[*Continued on page* 150]

American airplanes equipped with Hamilton controllable pitch propellers like these above were instrumental in enabling Ekins to set a world's air travel record. They permit short takeoffs, maximum speed.

Ekins, 4,000 miles ahead of his racing rivals, shakes hands with the Dutch (K-L-M) Airline pilot who flew him from Athens, Greece, to Batavia, Java. Dutch airlines favor American airplanes and engines.

TWA
THE LINDBERGH LINE

Above—Completing a flight of almost 26,000 miles in 18½ days, Ekins steps from a TWA Douglas transport at Newark, N. J., with a world's record for fast travel, using American aircraft most of the way.



Within the thickness of the pencil in the calipers, 20,000 thin razor edges can be stacked. Each edge is one-eighty-thousandth of an inch.

BEHIND THE RAZOR BLADE

by Robert W. Gordon

The oscillograph, an instrument that "sees" through steel, is used to detect hidden flaws.

TAKE a look at any group photograph of half a century ago. No matter what their station in life, the faces of the men you see there will be adorned with luxuriant crops of whiskers. Some were clipped plain, with the simple dignity of a cemetery hedge. Others were brushed and trimmed in weird and wonderful designs, like decorations on a wedding cake.

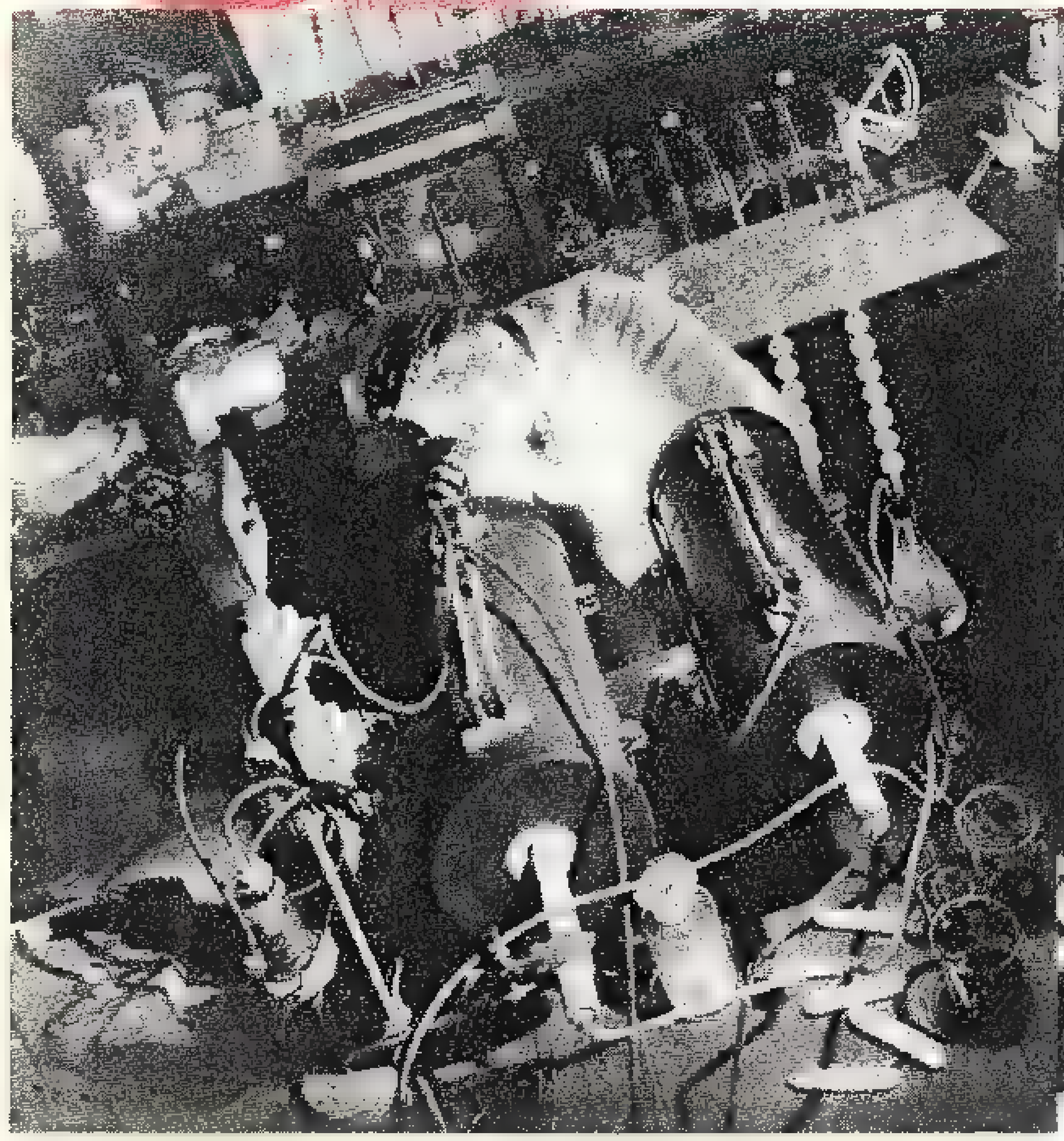
Now take a look along the street—any street in almost any country. You see a new race of men entirely. You can really see their faces, and they are bright and clean. No more of this hiding behind the bush. Their jaws are as bare of foliage as an oak tree in January.

Has science given us a new race of whiskerless males?

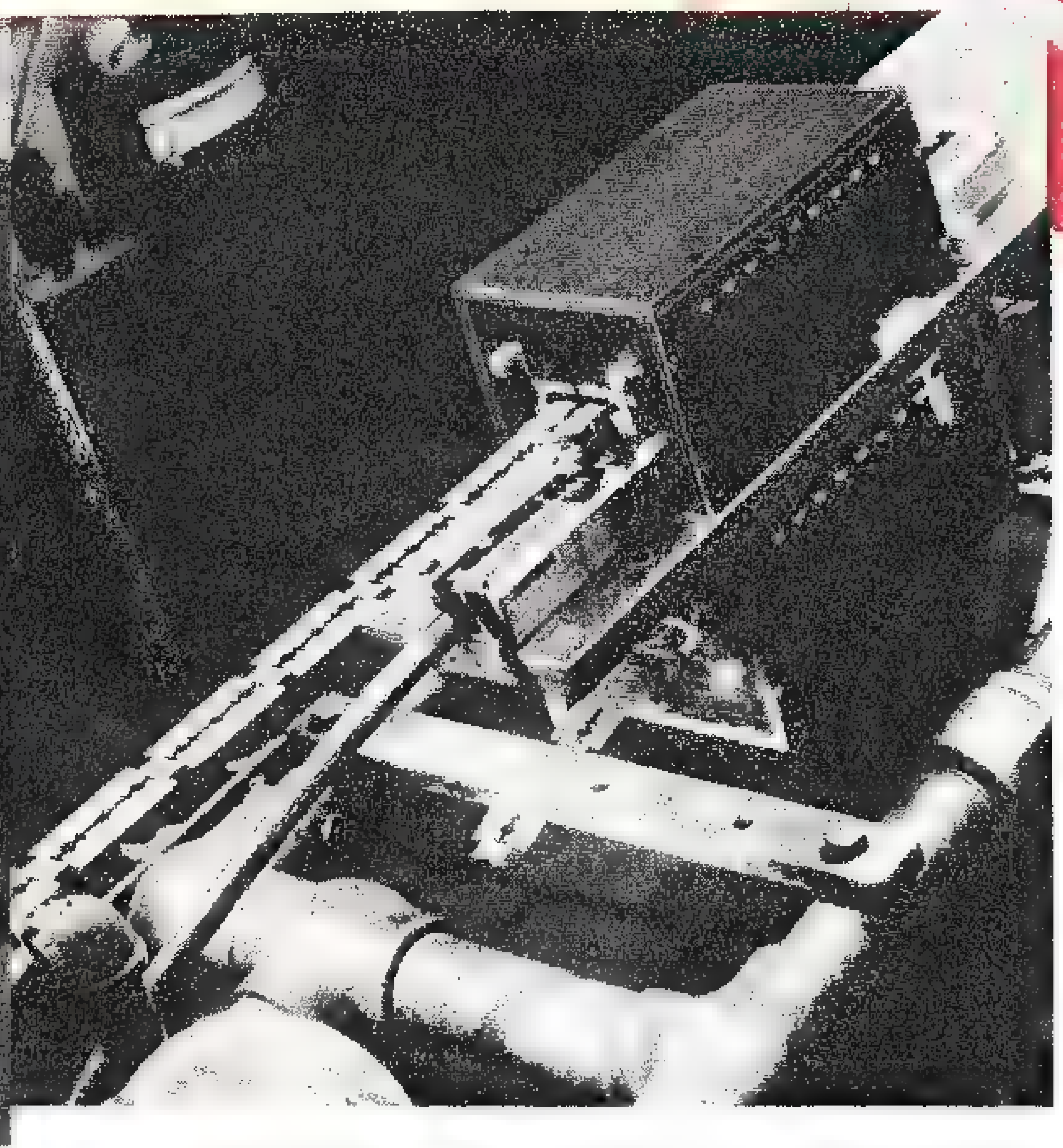
You know it has not. The whisker crop is as bountiful as ever, but it is harvested earlier—harvested every morning by the majority of men throughout the world.

Now the only conclusion we can draw from this is that men never really liked whiskers any more than did the women. But down through the centuries, elimination of the beard remained an ordeal.

Then along came King C. Gillette in 1895 with the safety razor. Whiskers didn't disappear over night. Men were proud of the wiry toughness of their beards. You couldn't convince *them* that a little piece of metal stuck into a miniature double-edged hoe, could make shaving a painless, two-minute chore.



A sample goes into an electric furnace to be burned in a stream of oxygen. Vapors are analyzed to see that the proper proportion of carbon is present.

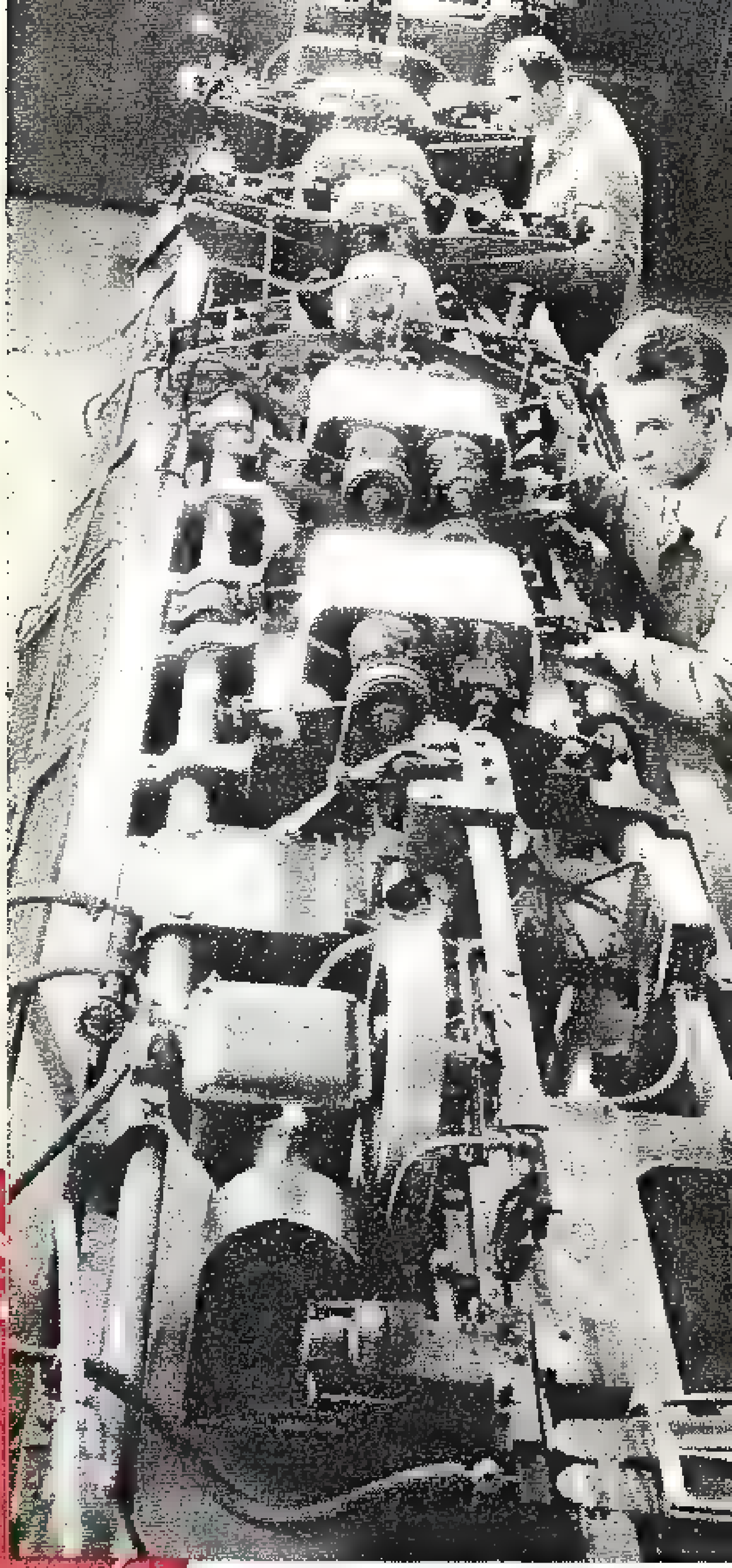


Variations in hardness are detected by this black box in the Gillette factory at Boston. If the steel in process above does not match the master strip below in hardness, the electricity going to furnace is varied.

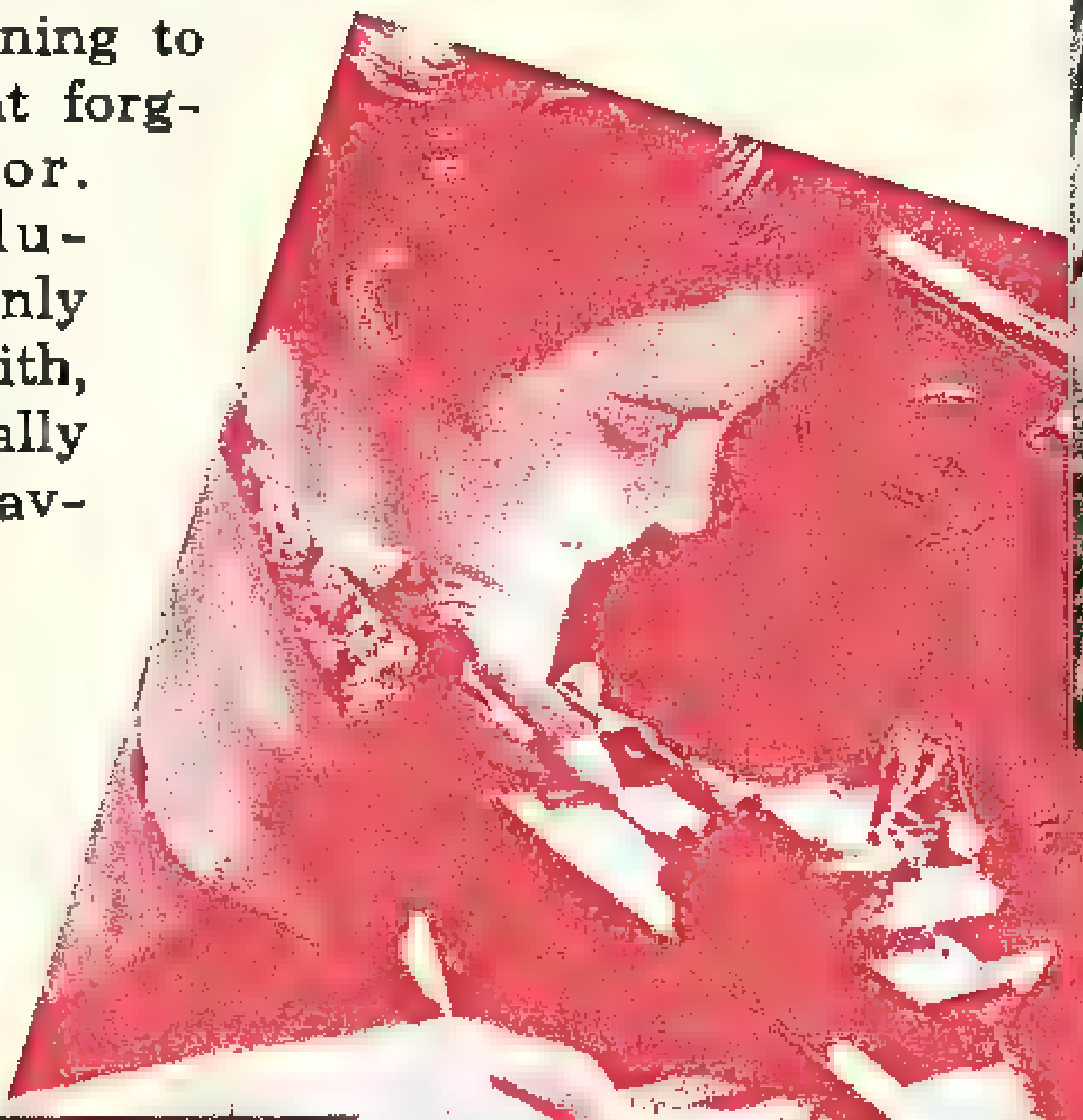
Even those few with faces too handsome to conceal, who went through the daily face-scraping with much the same martyr-to-looks spirit a woman assumes when getting a permanent, demanded a great steel forging, laboriously hollow ground, and equipped with a fancy handle. It required a lot of stropping and honing to keep a keen edge on that forging they called a razor.

Gillette had the revolutionary idea that it was only the edge you shaved with, and that the rest didn't really matter. He popularized shaving by developing an edge so sharp it is invisible, yet so cheap you can throw it away after using it once.

And the edge of the razor blade actually is invisible, even when looked at through the highest-powered microscope. The cutting edges of 80,000 blades, laid side by side, would occupy only one inch of space.

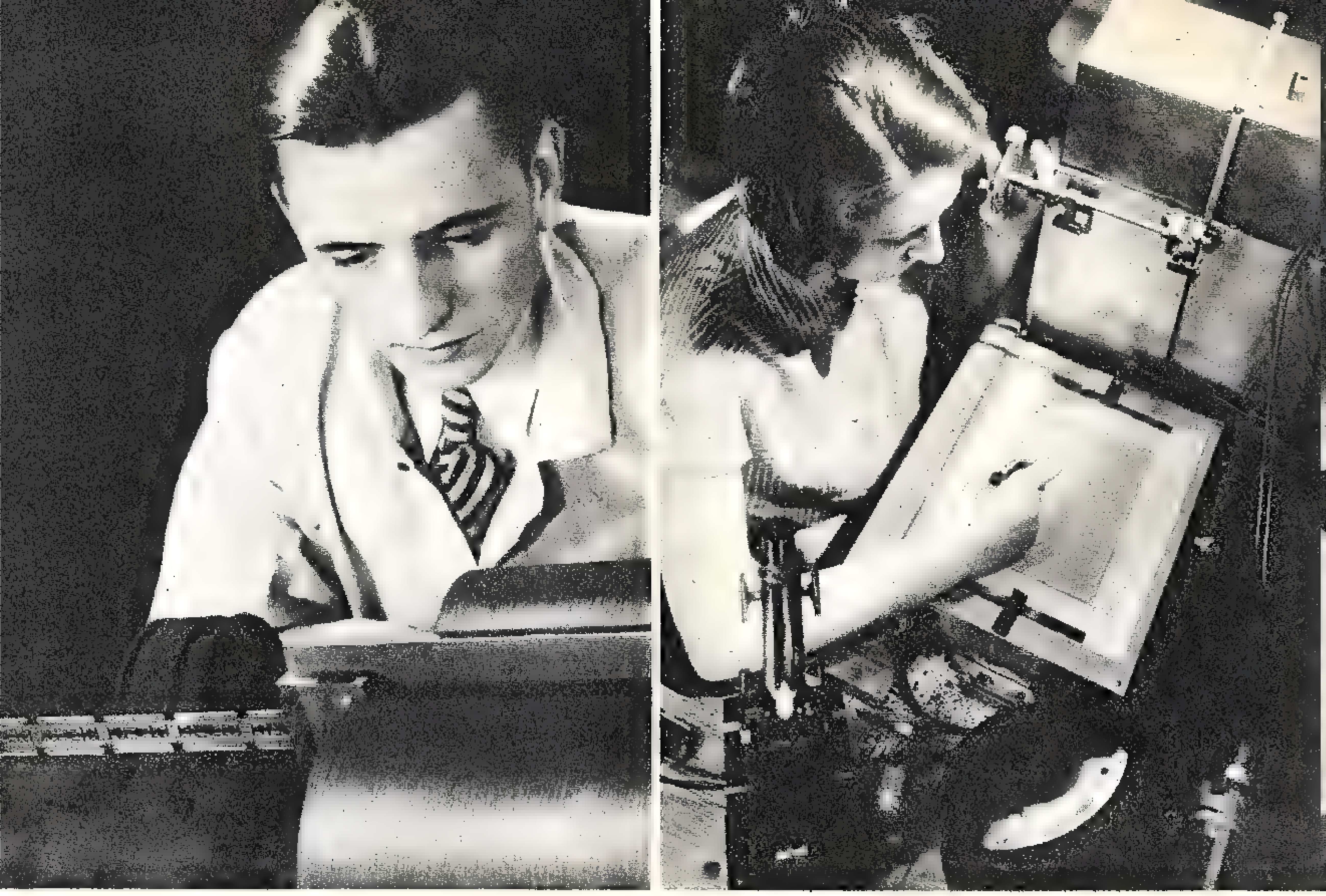


This machine performs one grinding, three honing and one stropping operation and cuts and stacks the blades on racks.



Samples of each coil are submitted to the diamond test for hardness. If it fails in the requirements, coil is rejected.

They demonstrate this absolute invisibility at the factory in Boston. They will show you a stack of blades a foot high, clamped together on a special holder. So accurately are the blades cut that the unsharpened ends appear as one solid bar of shining steel. Now turn the stack on edge. You see no shining metal there—only solid black. There is not enough metal on the cutting edges of that stack of blades to reflect a single beam of light. You can photograph it and get nothing on the plate but a solid black rectangle. Place a single blade on its side under a high-power microscope, and there will be no saw-tooth effect—only a straight line. Place the blade



Blades are pictured at left during the sharpening process. Two sets of grinding wheels, one for each edge, first remove the rough stock. The girl at the right is operating the photoelectric sharpness testing machine.

on edge and you will see nothing. One-eighty-thousandth of an inch is too infinitesimal a point in space to be seen by the eye, even when aided by the highest-powered microscope science has produced.

To obtain a cutting edge so sharp, close control and microscopically-fine limits of accuracy are required for every operation of manufacture.

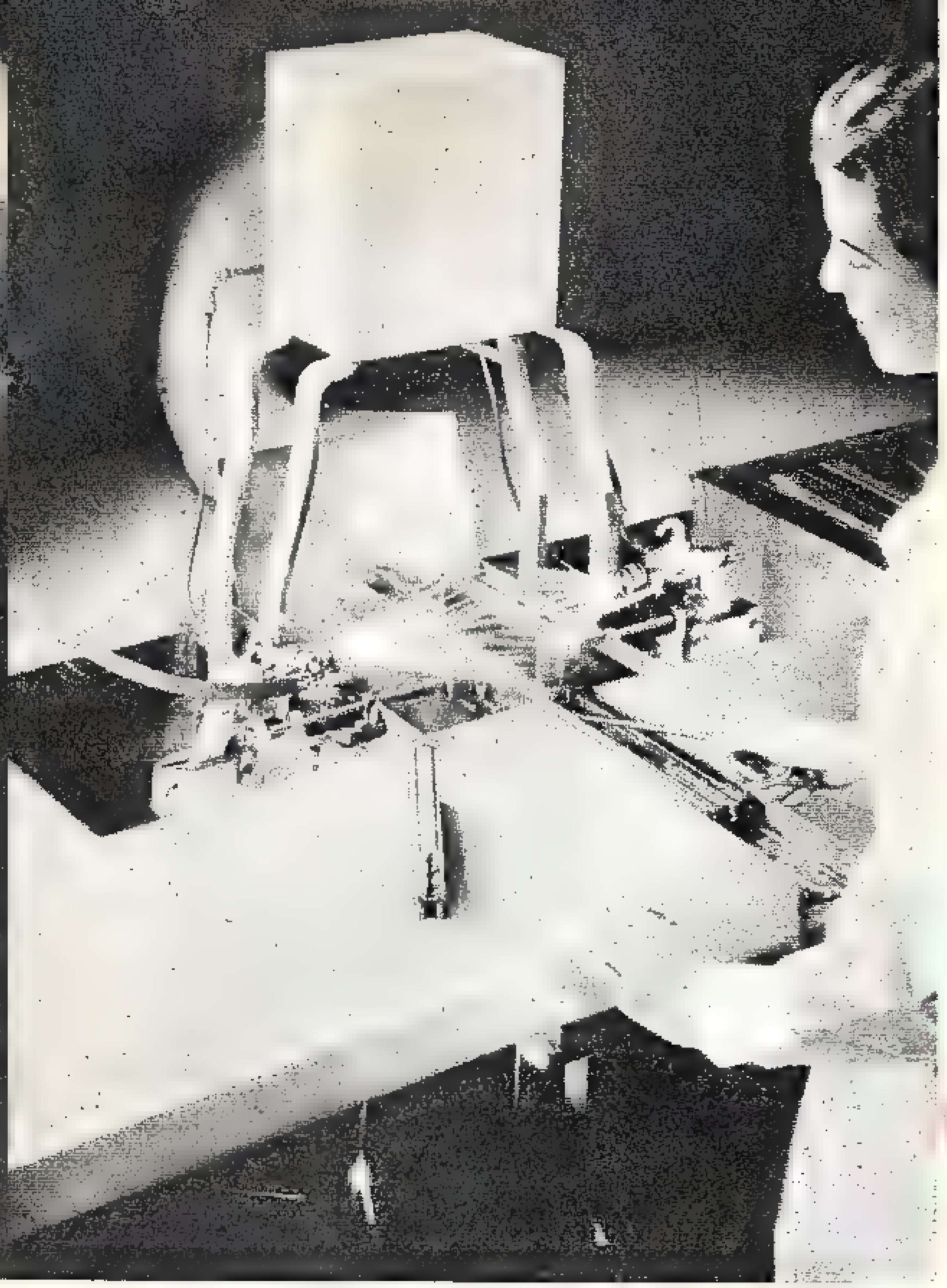
Swedish steel is used because of the high quality of Swedish raw materials and the long experience and great skill in rolling possessed by the Scandinavian mills. To insure uninterrupted production schedules with accompanying uniformity of quality, a tremendous steel inventory, representing an investment of several hundred thousand dollars, is carried in storage.

The coils of raw steel arrive from Sweden, each wrapped in heavy crepe paper, covered with oily waterproof paper, while the surfaces of the steel ribbons are coated with a special rust-proofing compound. Six coils are hermetically sealed in a tin container, which is protected by a wooden box. Thus protected, the shipping case could be immersed in sea water without damage to the contents.

As the cases are opened at the factory, a sample is cut from each end and tagged with the number of the coil. Another tag is placed on the coil itself, and follows the steel throughout the factory until the finished blades are packed. Each person who handles that particular coil, whether for manufacture or testing, must initial the tag. When the coil passes from one stage of manufacture to another, it is checked in and out of the control room. This intricate system of checking and rechecking makes it possible to detect flaws instantly and trace them to their source. It makes it possible to guarantee that only perfect blades will be offered for sale.

The original samples of the soft cold-rolled steel are submitted to a series of rigid laboratory tests to see that specifications for width, thickness, and metallurgical characteristics are fulfilled, and only when these tests are completed, and an O. K. placed on the tag, is the coil released for production.

Width and thickness are checked by micrometer gauges, and the variations permitted are infinitesimally small. A sample is then placed in the oscillograph, an instrument that virtually sees through steel. Hidden flaws, strains resulting from improper rolling, incorrect micro-structure, are instantly detected.



As a final step in the long process, finished blades are sprayed with a powerful antiseptic solution. They are then wrapped and sealed.

Samples of each coil are then sent to the laboratory and microphotographed at 3,000 diameters. A trained metallurgist studies these photographs to determine if the inner structure, the combination of elements making up the metal, is suitable for blades.

Another sample goes into an electric furnace, to be burned in a stream of oxygen. Vapors resulting from this combustion are analyzed chemically to see that exactly the right proportion of carbon is present.

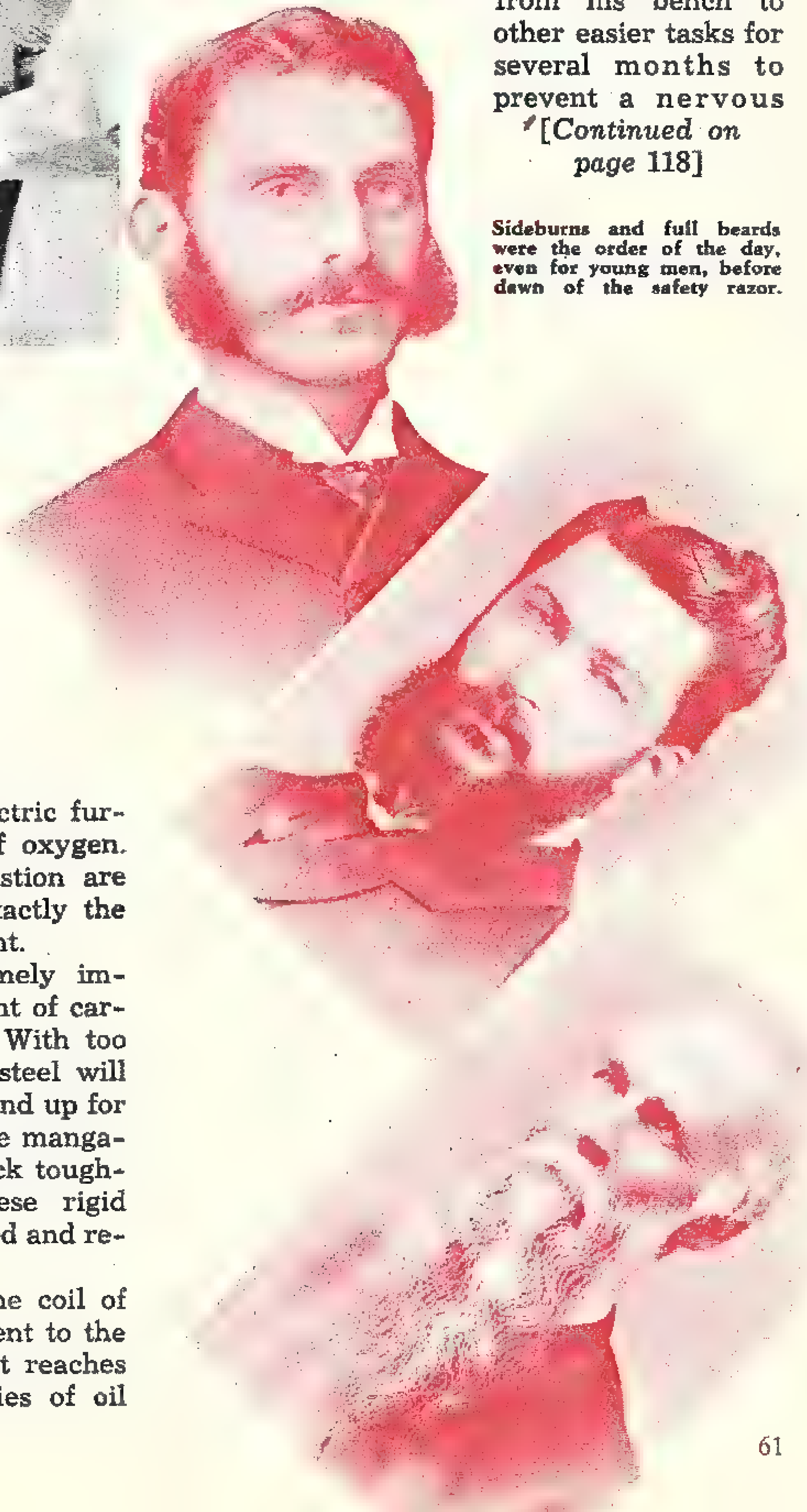
This chemical content is extremely important. Without the proper amount of carbon the steel will lack hardness. With too much sulphur or phosphorus, the steel will not yield a cutting edge that will stand up for a number of shaves. With too little manganese or chromium, the steel will lack toughness. Metal failing to meet these rigid laboratory tests is immediately crated and returned to Sweden.

If approved in the laboratory, the coil of soft steel is wound on a reel and sent to the perforating machine. But before it reaches the dies it feeds through two series of oil wipers, which remove any foreign matter adhering to the strip and add an oil which aids the perforating die and prevents rust between this and the next operation.

These dies that punch out the center slot are the acme of accuracy. They must be if the blade is to be held in the razor at the correct position for a proper shave. Unable to obtain such accuracy elsewhere, the factory employs its own corps of die cutters, any one of whom could grind the print off this page without removing a particle of the paper.

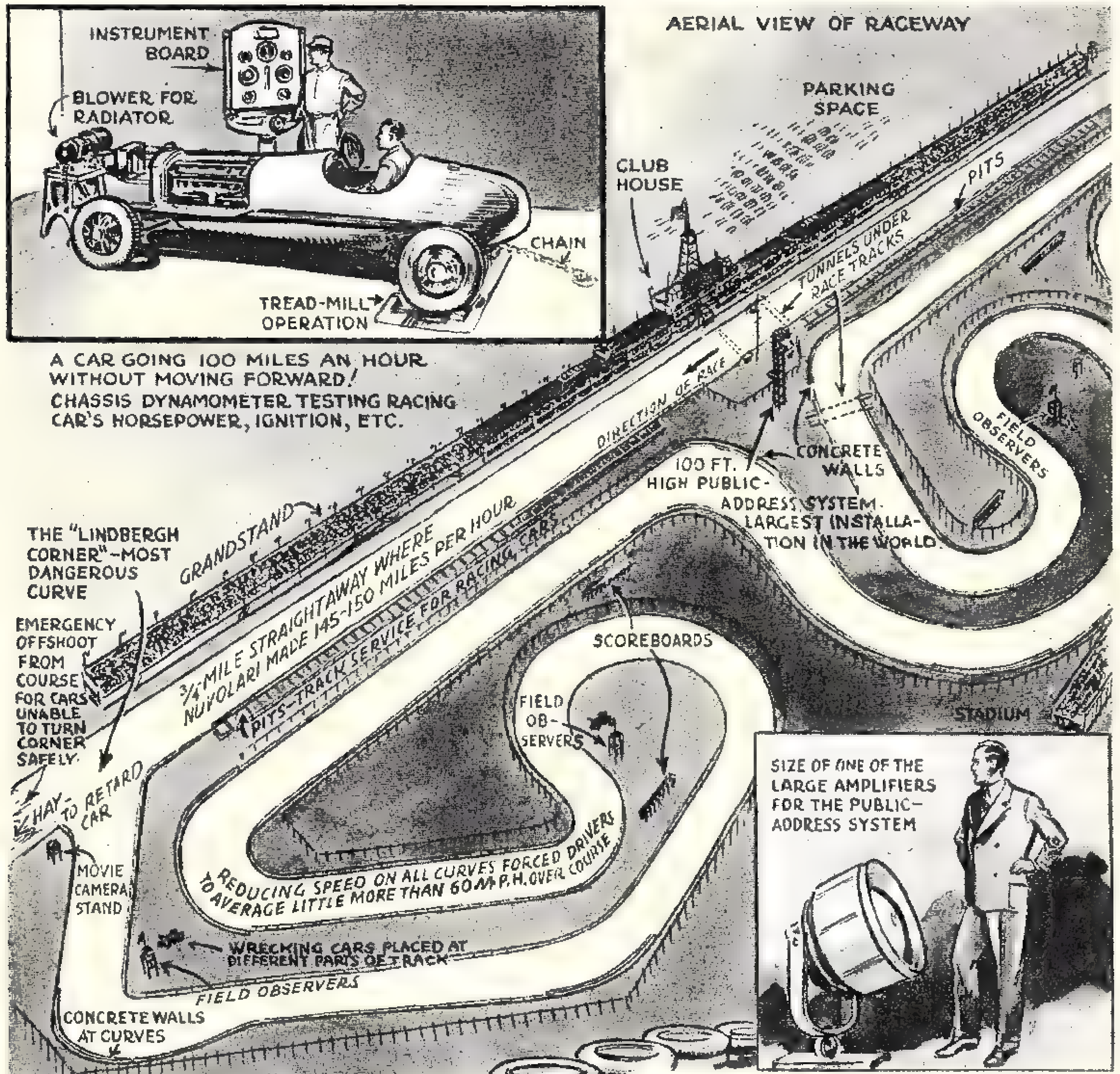
So critical is the workmanship demanded here that in certain cases it has been necessary to release a man from his bench to other easier tasks for several months to prevent a nervous

[*Continued on page* 118]



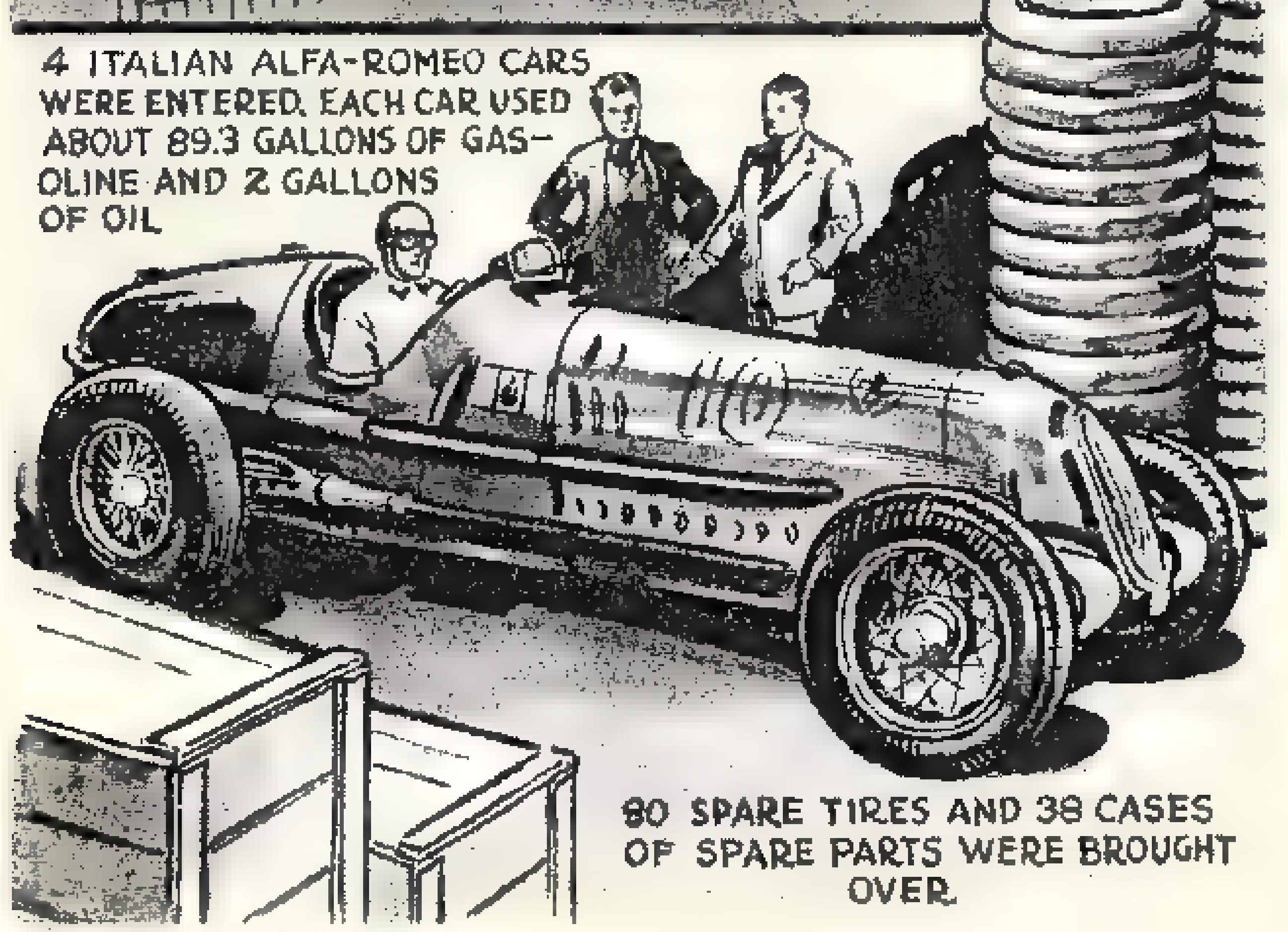
Sideburns and full beards were the order of the day, even for young men, before dawn of the safety razor.

AMERICA'S NEWEST AUTO RACE TRACK


INSTRUMENT BOARD
BLOWER FOR RADIATOR
CHAIN
TREAD-MILL OPERATION
AERIAL VIEW OF RACEWAY
PARKING SPACE
CLUB HOUSE
PITS
TUNNELS UNDER RACE TRACKS
DIRECTION OF RACE
CONCRETE WALLS
FIELD OBSERVERS
100 FT. HIGH PUBLIC-ADDRESS SYSTEM. LARGEST INSTALLATION IN THE WORLD.
GRANDSTAND
THE "LINDBERGH CORNER"-MOST DANGEROUS CURVE
EMERGENCY OFFSHOOT FROM COURSE FOR CARS UNABLE TO TURN CORNER SAFELY.
3/4-MILE STRAIGHTAWAY WHERE NUVOLARI MADE 145-150 MILES PER HOUR
PITS-TRACK SERVICE FOR RACING CARS
SCOREBOARDS
FIELD OB-SERVERS
STADIUM
HAY-TO RETARD CAR
MOVIE CAMERA STAND
REDUCING SPEED ON ALL CURVES FORCED DRIVERS TO AVERAGE LITTLE MORE THAN 60 M.P.H. OVER COURSE
WRECKING CARS PLACED AT DIFFERENT PARTS OF TRACK
FIELD OBSERVERS
CONCRETE WALLS AT CURVES

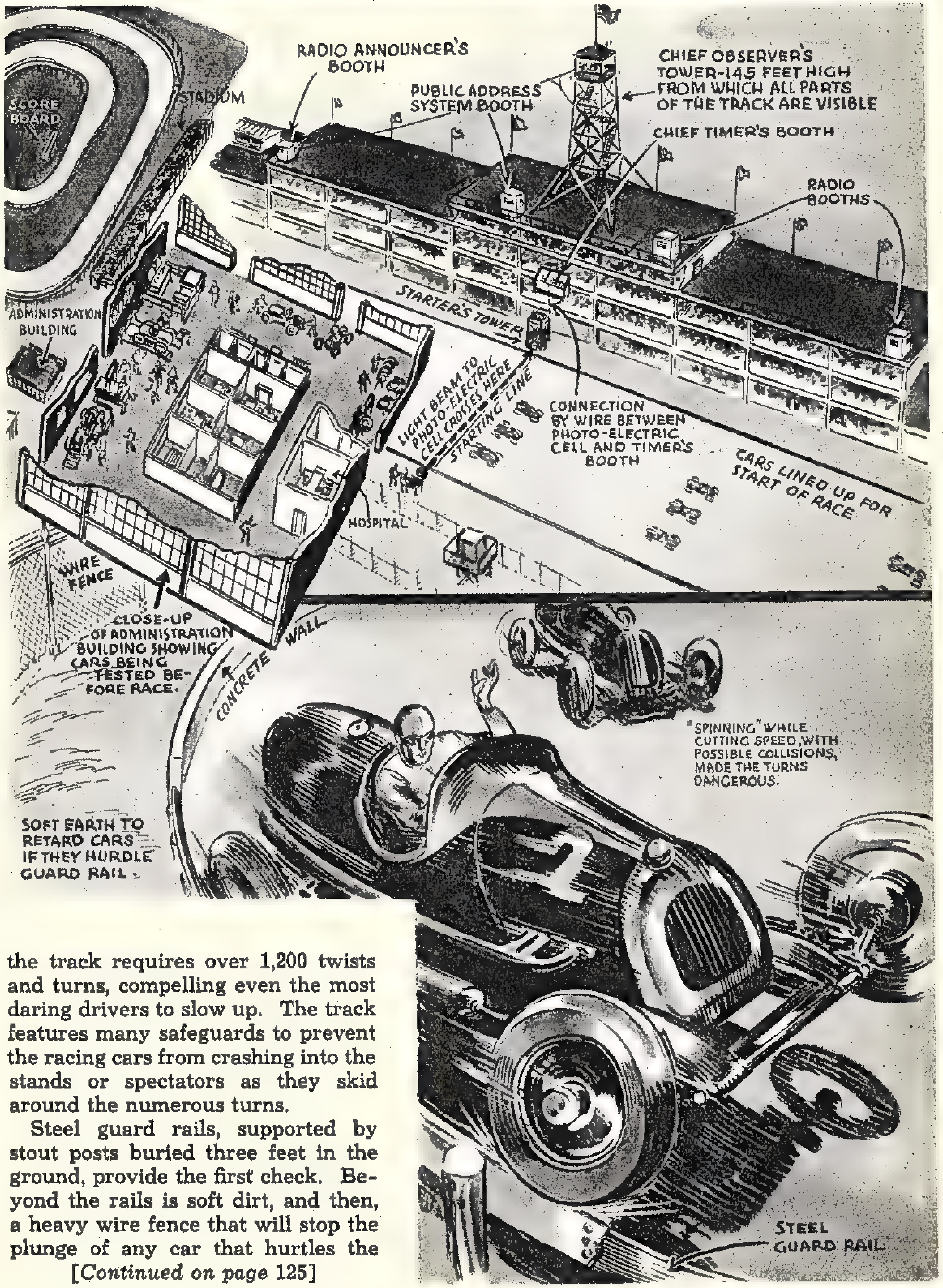
A CAR GOING 100 MILES AN HOUR WITHOUT MOVING FORWARD! CHASSIS DYNAMOMETER TESTING RACING CAR'S HORSEPOWER, IGNITION, ETC.

SIZE OF ONE OF THE LARGE AMPLIFIERS FOR THE PUBLIC-ADDRESS SYSTEM



4 ITALIAN ALFA-ROMEO CARS WERE ENTERED. EACH CAR USED ABOUT 89.3 GALLONS OF GASOLINE AND 2 GALLONS OF OIL

80 SPARE TIRES AND 38 CASES OF SPARE PARTS WERE BROUGHT OVER


SCORE BOARD
STADIUM
RADIO ANNOUNCER'S BOOTH
PUBLIC ADDRESS SYSTEM BOOTH
CHIEF OBSERVER'S TOWER-145 FEET HIGH FROM WHICH ALL PARTS OF THE TRACK ARE VISIBLE
CHIEF TIMER'S BOOTH
RADIO BOOTHS
ADMINISTRATION BUILDING
STARTER'S TOWER
LIGHT BEAM TO PHOTO-ELECTRIC CELL CROSSES HERE
STARTING LINE
CONNECTION BY WIRE BETWEEN PHOTO-ELECTRIC CELL AND TIMER'S BOOTH
CARS LINED UP FOR START OF RACE
HOSPITAL
WIRE FENCE
CONCRETE WALL
SOFT EARTH TO RETARD CARS IF THEY HURDLE GUARD RAIL.
STEEL GUARD RAIL

CLOSE-UP OF ADMINISTRATION BUILDING SHOWING CARS BEING TESTED BEFORE RACE.

"SPINNING" WHILE CUTTING SPEED, WITH POSSIBLE COLLISIONS, MADE THE TURNS DANGEROUS.

ROOSEVELT RACEWAY, located at Westbury, L. I., is America's newest and most dangerous automobile race track. So dangerous is the four-mile track with its twists and turns that Tazio Nuvolari, of Italy, who won the Vanderbilt Cup and $24,000 of the $60,000 prize money at the opening race last Columbus Day, averaged only 65.998 m.p.h. in his Alfa-Romeo racer although he attained speeds of 145-150 m.p.h. on the straightaways.

The average 75-mile race staged at the track requires over 1,200 twists and turns, compelling even the most daring drivers to slow up. The track features many safeguards to prevent the racing cars from crashing into the stands or spectators as they skid around the numerous turns.

Steel guard rails, supported by stout posts buried three feet in the ground, provide the first check. Beyond the rails is soft dirt, and then, a heavy wire fence that will stop the plunge of any car that hurtles the

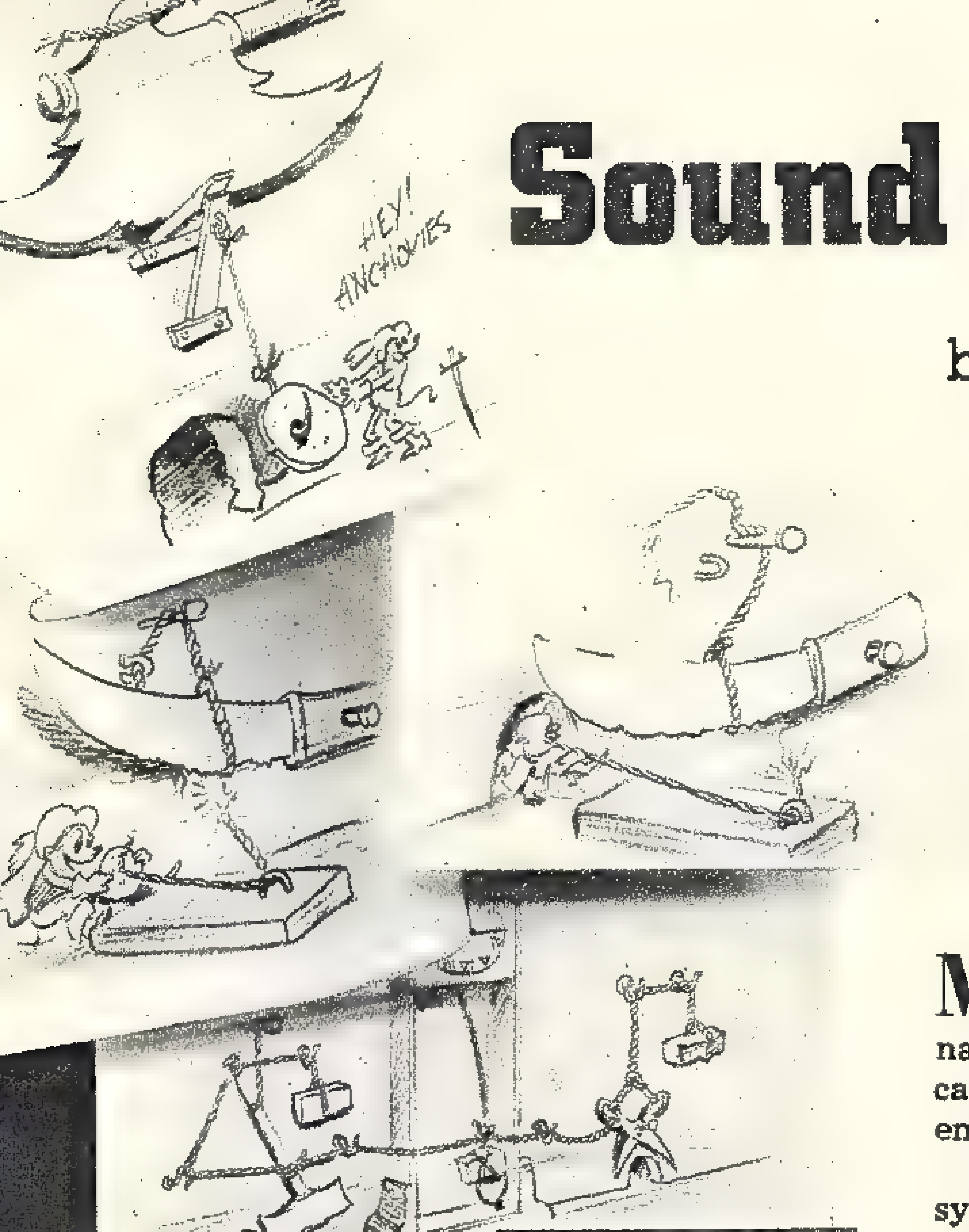
[*Continued on page* 125]

Sound Tricks of Mickey Mouse

by Earl Theisen

Illustrated by Walt Disney

Squeaks, squawks, oinks and music—it's another animated cartoon hit, set to music in a brand new way. Read how the hay baler joins a symphony.


HEY! ANCHOVIES

The movies have long recognized the dramatic possibilities of Dumas' *Three Musketeers.* It took Walt Disney to recognize the humorous possibilities of the *Three Mouseketeers.* Here are four "rough sketches" which outline the action.

MUSIC and noises in the animated cartoon interpret the action of the story. The narrative theme of the music and what is called the "sound effects" punctuates and emphasizes the story.

By playing on the aural nerves with symbolic sounds and noises the psychological reaction of the audience is controlled and varied according to the dramatic and emotional needs of the cartoon story.

If Donald Duck falls, for example, it is not enough for the sound man to hit a drum for the noise, but an additional sound characteristic must be added to convey a certain kind of fall. There are dozens of different "sound effects" for cartoon character falls which vary according to the story. When a sympathetic attitude is desired, the "fall" sound is hollow and devoid of jarring characteristics, while a harsh sound which shocks the aural nerves is created for that effect.

The associative value of sounds is widely used for humor, such as a tearing noise which accompanies the falling of a character. For humorous responses the "sound effect" is often caricatured and distorted. An example of this was the tire skidding noise used in "The Tortoise and the Hare" when the fast moving rabbit slid to a stop.

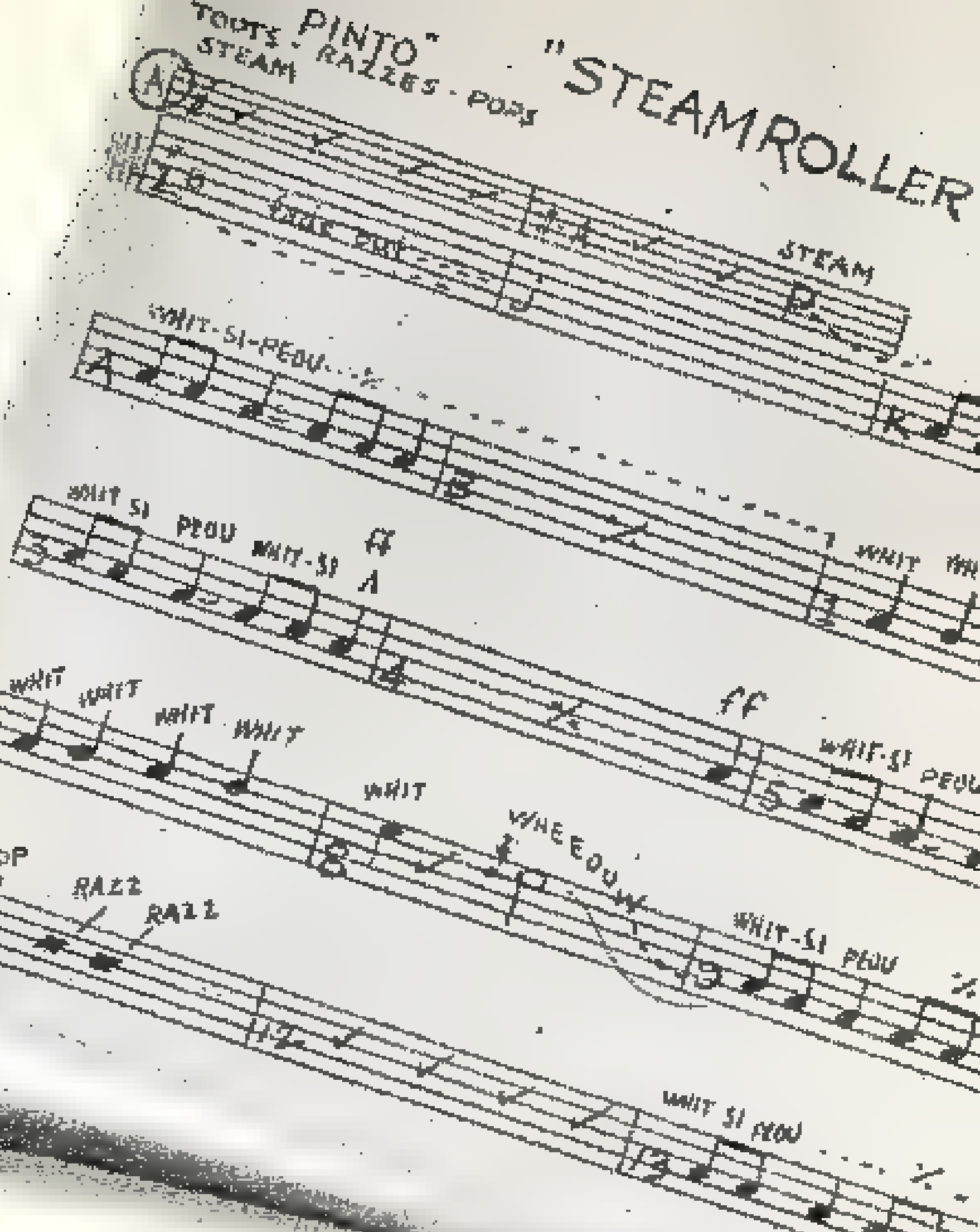
Through study and experimentation Walt Disney and his engineers have found that by introducing music or various sounds and noise frequencies into the cartoon, the response of the audience is varied and controlled. By combining noises of certain pitches or tempos the psychological values of the cartoon music is emphasized in keeping with the story requirements.

Sound of sixteen cycles is deep toned and may be used for conveying heavy or depressing moods, whereas the sound of a higher frequency is what William Garity, Chief Engineer at Walt Disney's, calls the "pain sensitive region." Noises of this higher pitch make the hearer alert and may be carried to the point of actually causing distress, such as a "file on glass" noise. The average ear is very sensitive to sounds of 2,000 or 3,000 cycles and unless some sound of this pitch is added to the cartoon background noise, the audience is less responsive to the effects.

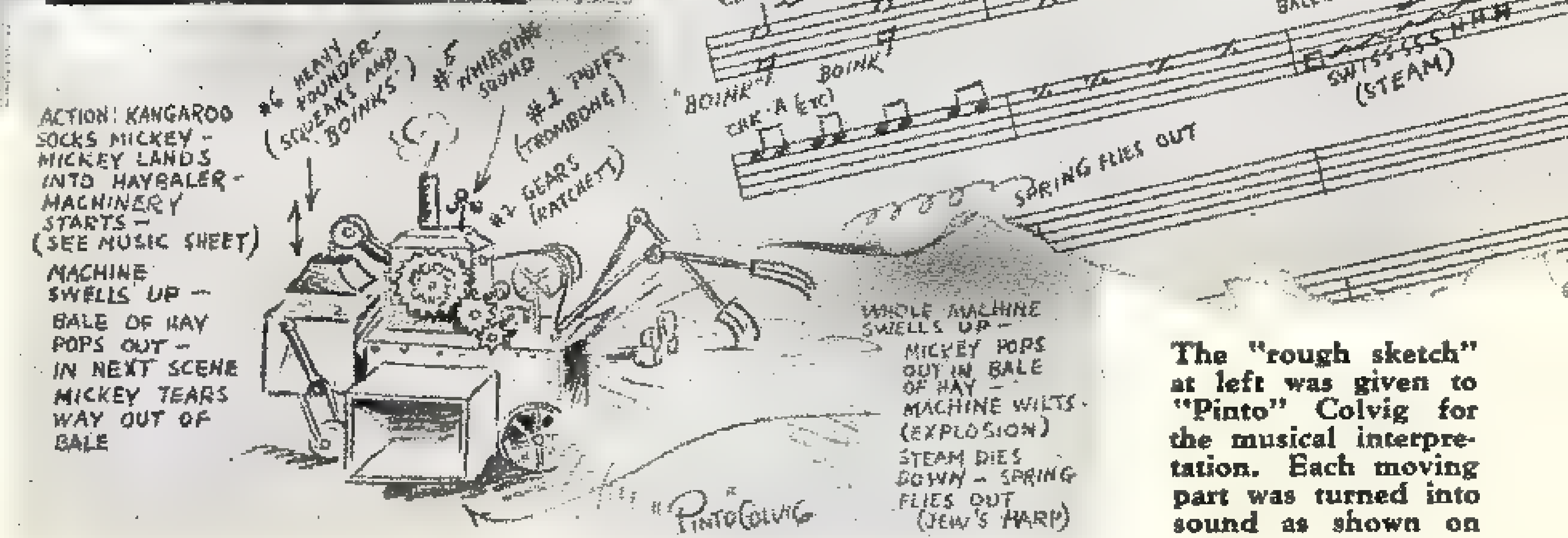
Stories are told by sound. "Pinto" Colvig, who wrote the lyrics for "The Three Little Pigs" and who does many of the sound "imitations" for automobiles, airplanes, or machines when they assume human characteristics, is able to convey a whole story by sound. For example, in a recent picture he caricatured a steam roller at work by suitable noises, pops, puffs, razzes, and wheezes. Vocally, without the aid of mechanical de-

Copies of the "rough sketches" go to the cartoonists and musicians who build up the action and sound effects to the point illustrated. Above the results are being synchronized, and at right are some sound effect implements.

Walt Disney tempts a penguin into conversation with a strip of fish. Once the penguin begins to talk, his voice is recorded for movie cartoon use. This bird is heard in the film, *Peculiar Penguins.* All sorts of tricks are needed to persuade various animals to "talk."

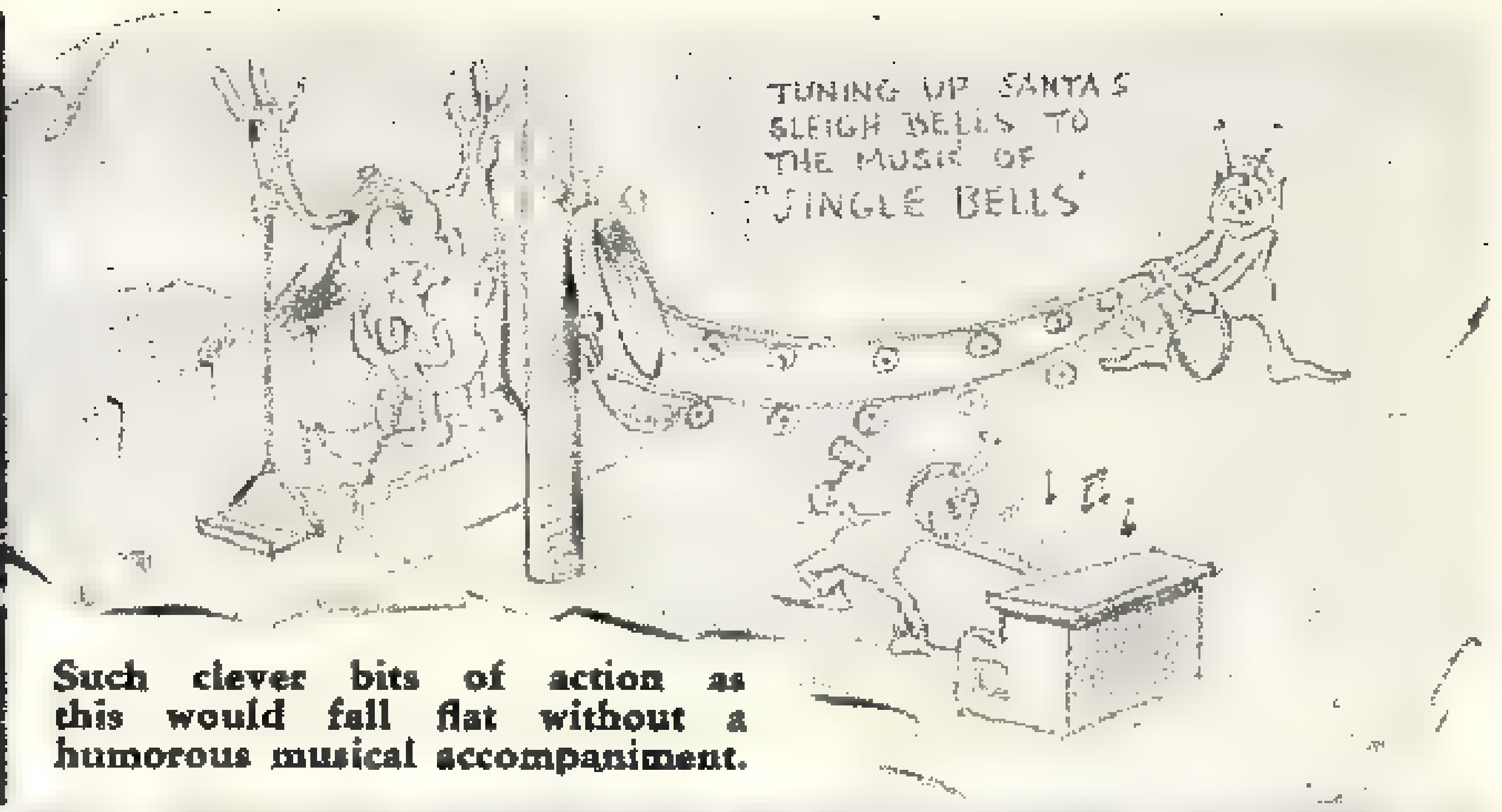

"PINTO"
TOOTS - RAZZES - POPS
STEAM
"STEAMROLLER
A
STEAM
WHIT-SI-PEOU
B
WHIT SI
PEOU
WHIT-SI
ff
WHIT
WHIT
WHIT
WHIT
WHIT
ff
WHIT-SI PEOU
WHIT
WHEEOUW
WHIT-SI PEOU
B
POP
RAZZ
RAZZ
WHIT SI PEOU

Part of the musician's score for a "steam roller symphony." Without music, the action would lack life.


"PINTO'S PART
(HAYBALER) MICKEY'S KANGAROO
- SOUND EFFECTS - (2 TRACKS)
(TEST)
2/10'S
(IN PIPE - SMOKESTACK)
CHOO
CHOO
CHOO
CHOO
CHOO CHOO
CHOO CHOO
"BOINK"
BOINK
CHK-A (ETC)
BALER SWELLS
POP
SWISSSSHHH
(STEAM)
SPRING FLIES OUT
ACTION: KANGAROO SOCKS MICKEY - MICKEY LANDS INTO HAYBALER - MACHINERY STARTS - (SEE MUSIC SHEET)
MACHINE SWELLS UP - BALE OF HAY POPS OUT - IN NEXT SCENE MICKEY TEARS WAY OUT OF BALE
#6 HEAVY POUNDER - (SQUEAKS AND 'BOINKS')
#5 WHIRRING SOUND
#1 PUFFS (TROMBONE)
#2 GEARS (RATCHETT)
WHOLE MACHINE SWELLS UP - MICKEY POPS OUT IN BALE OF HAY - MACHINE WILTS - (EXPLOSION) STEAM DIES DOWN - SPRING FLIES OUT (JEW'S HARP)
"PINTO" COLVIG

The "rough sketch" at left was given to "Pinto" Colvig for the musical interpretation. Each moving part was turned into sound as shown on finished score above.

A last minute conference before recording. Disney and his director talk it over with the conductor.


TUNING UP SANTA'S SLEIGH BELLS TO THE MUSIC OF "JINGLE BELLS'

Such clever bits of action as this would fall flat without a humorous musical accompaniment.

The Silly Symphony orchestra on the special resonator floor which is used for special effects. Fifty or sixty hours of rehearsal are required in the production of the average film.

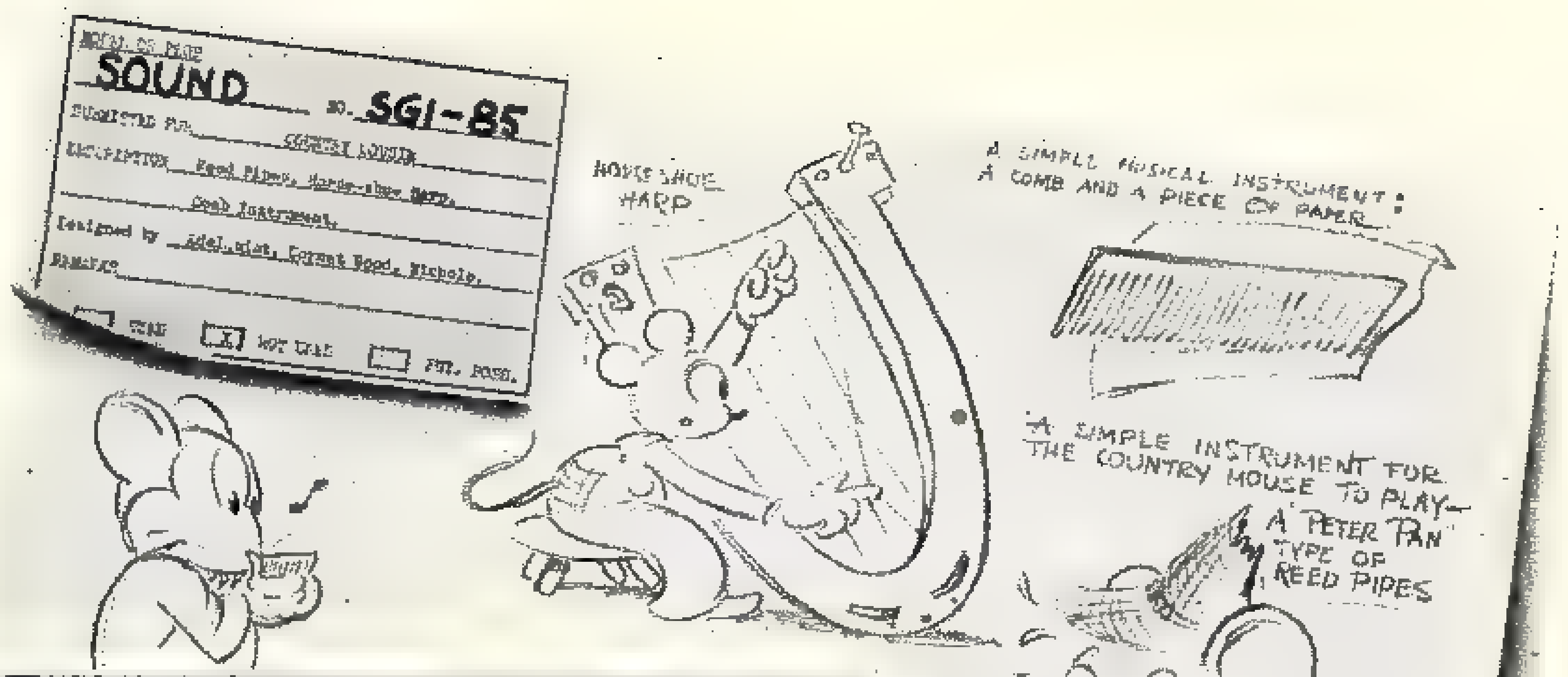
In the Monitor room the director, head engineer and Disney listen to the sounds produced on the sound stage. Here sound is reproduced exactly as it will be heard in the theater.

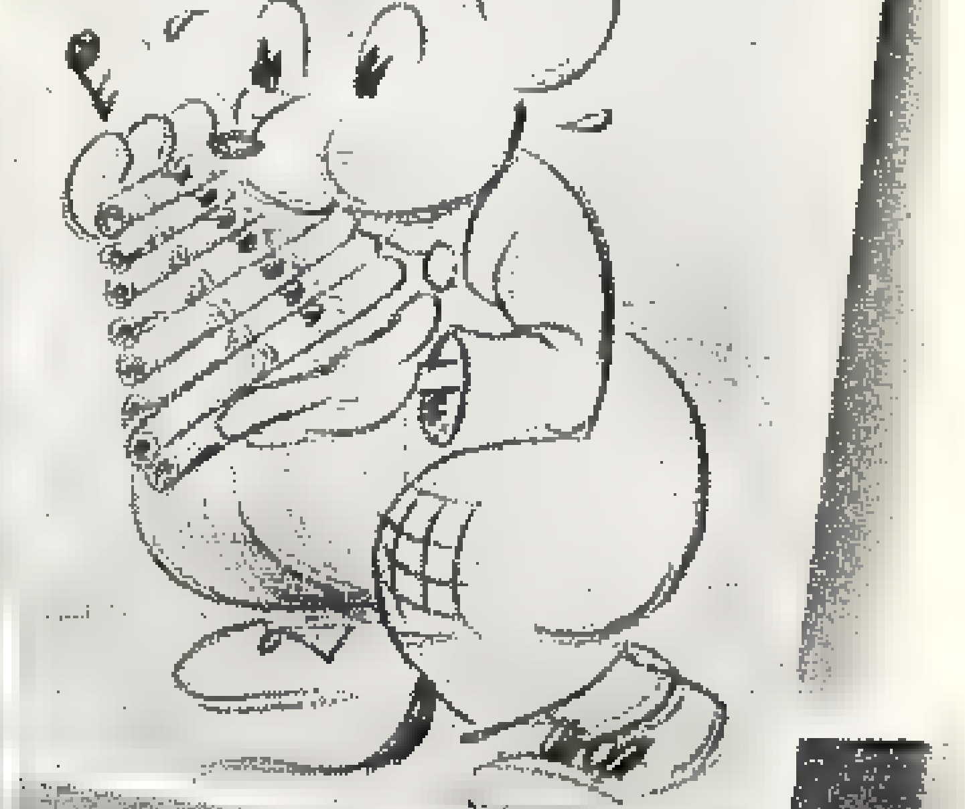
vices, he depicted a narrative episode of a very busy steam roller that worked hard, then got tired and stopped. To do this he made a picture on paper of the sound by working out the suitable suggestive sounds and inflections which he set down on music paper according to the desired effects, tonal range, and tempo which brought to life the pen and ink steam shovel. "Pinto" Colvig with the aid of a trombone and vocal sounds can make an airplane do all sorts of antics. Real airplane sounds cannot be controlled to musical tempo for cartoon effects.

Each sound in a cartoon film is the result of much thought. Such things as bugs, all sizes, getting the hiccoughs which happened in "Mickey's Garden" when Mickey sprayed them with "bug eliminator" required hours of rehearsal before the sound was recorded. For some sounds hours are required in rehearsal, and fifty or sixty hours are required to make the sound for the average cartoon.

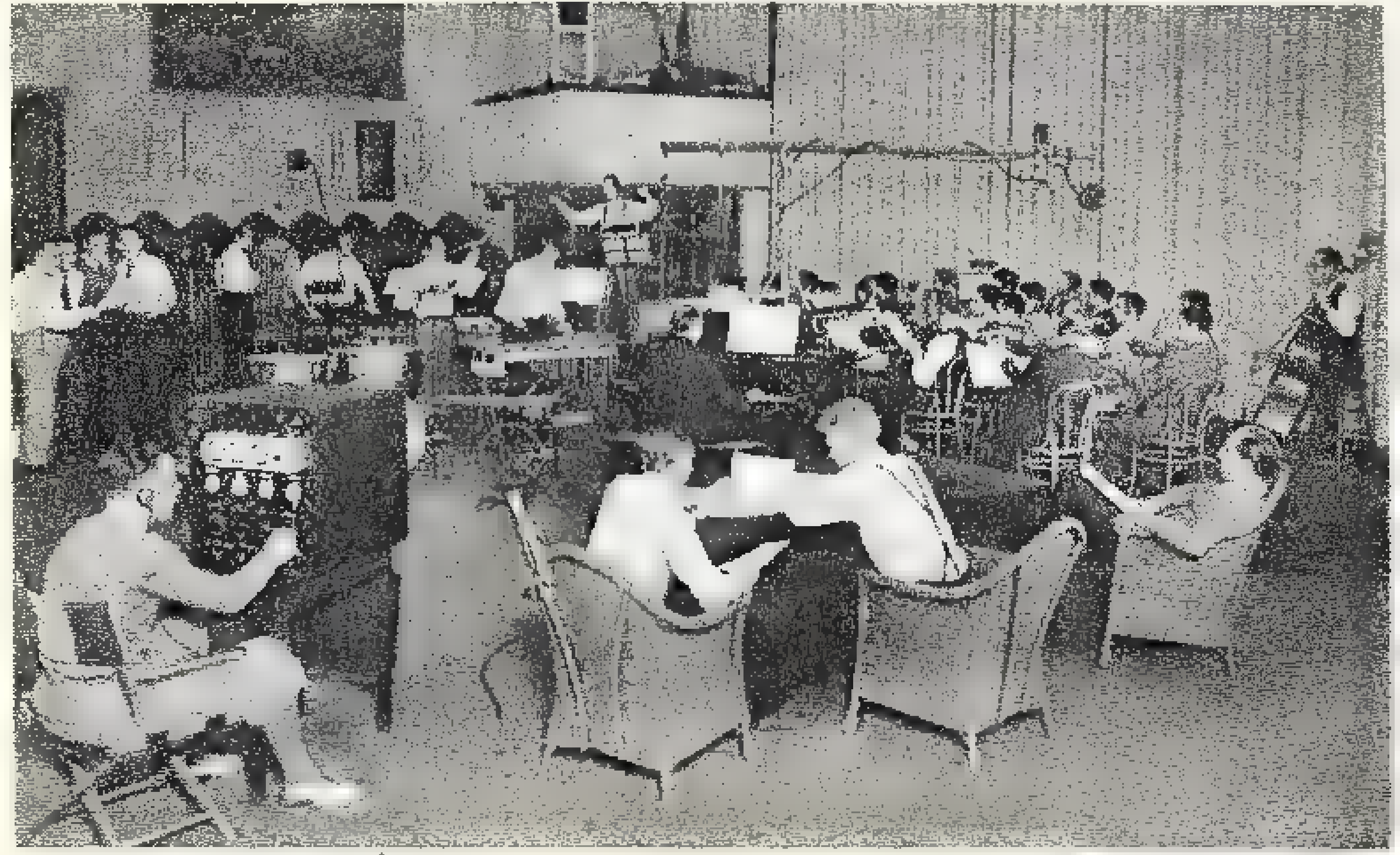
There are six men and women under contract at Disney's who do nothing but mimic and imitate many sounds. The distorted Donald Duck conversation and singing is done entirely by mouth without mechanical aid, as is that of Madame Clara Cluck, Mickey, and the other characters. Walt, himself, does the Mickey chatter. Much of the "imitator's" time is spent in inventing cartoon noises.

For cartoon kisses, the "imitator" kisses his own hand or arm. For a Mickey-Minnie embrace, the "imitator" kisses the heel of his hand, while a tiny bug osculation is obtained from his thumb. A moist noisy smack is gained by kissing his arm at the elbow bend. Cartoon embraces are not as emotional as they are humorous because of the caricatured sound.


SOUND
No. SGI-85
HORSE SHOE HARP
A SIMPLE MUSICAL INSTRUMENT: A COMB AND A PIECE OF PAPER
A SIMPLE INSTRUMENT FOR THE COUNTRY HOUSE TO PLAY— A PETER PAN TYPE OF REED PIPES



Each gag used in a Silly Symphony is selected from hundreds of others. The gag department contains thousands of inventions which will never be patented, for they operate only upon film for the amusement of theater patrons. Here are some ideas submitted for *The Country Cousin* but not used. They will be filed according to description on the card.



Here is a Silly Symphony in full swing, from the quartet at left and sound effects men at center to the orchestra at right. The panel at left "mixes" and blends the various sounds.

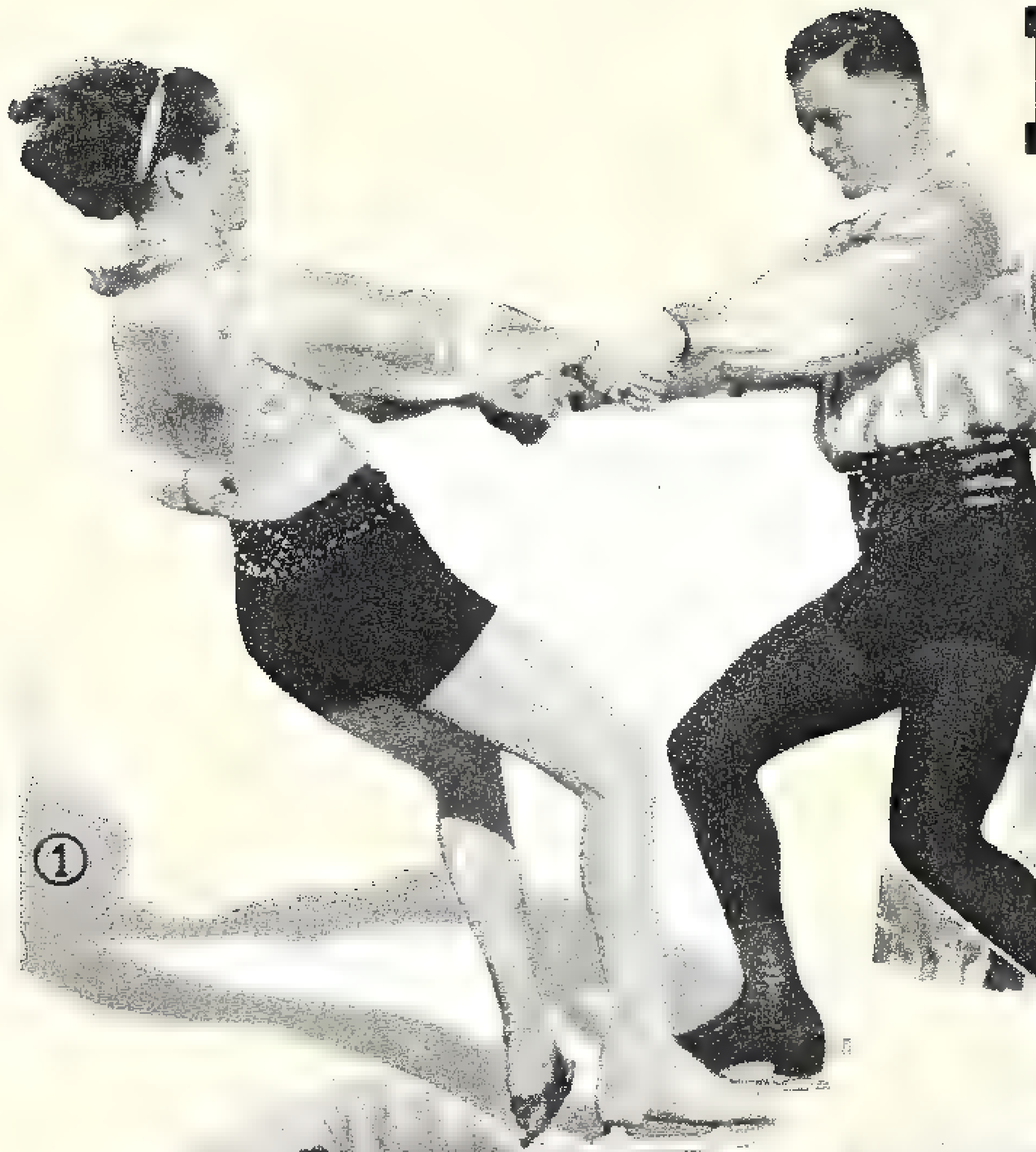
Now that music is carrying a big part of the action, the cartoon animator times his action to so many drawings per beat of music. The number varies according to the musical time.

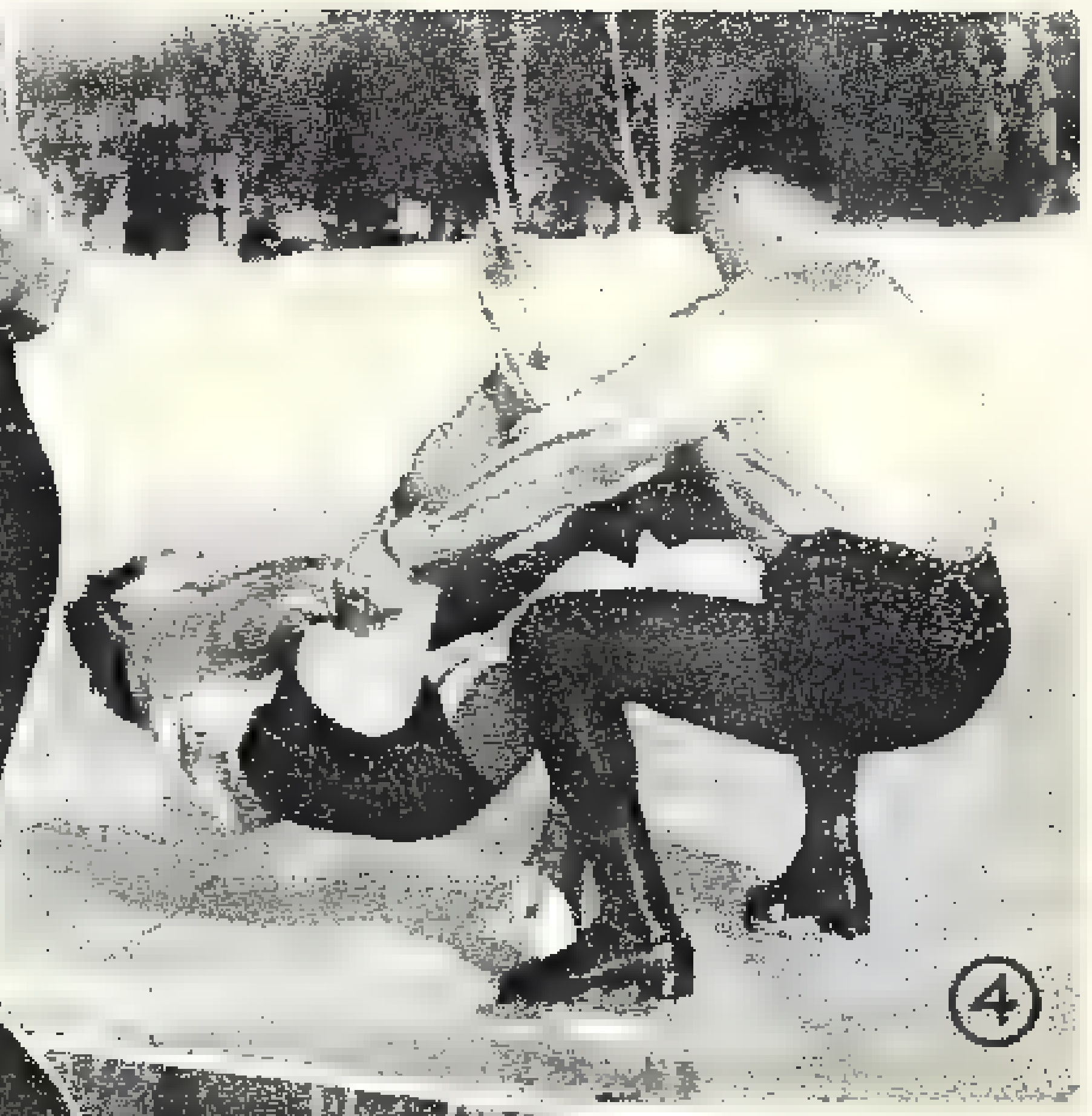
Recently a sound of a cartoon character talking under water was needed. After much experimentation, the sound was made by one of the "imitators" who talked while a common garden hose ran a stream of water into his mouth.

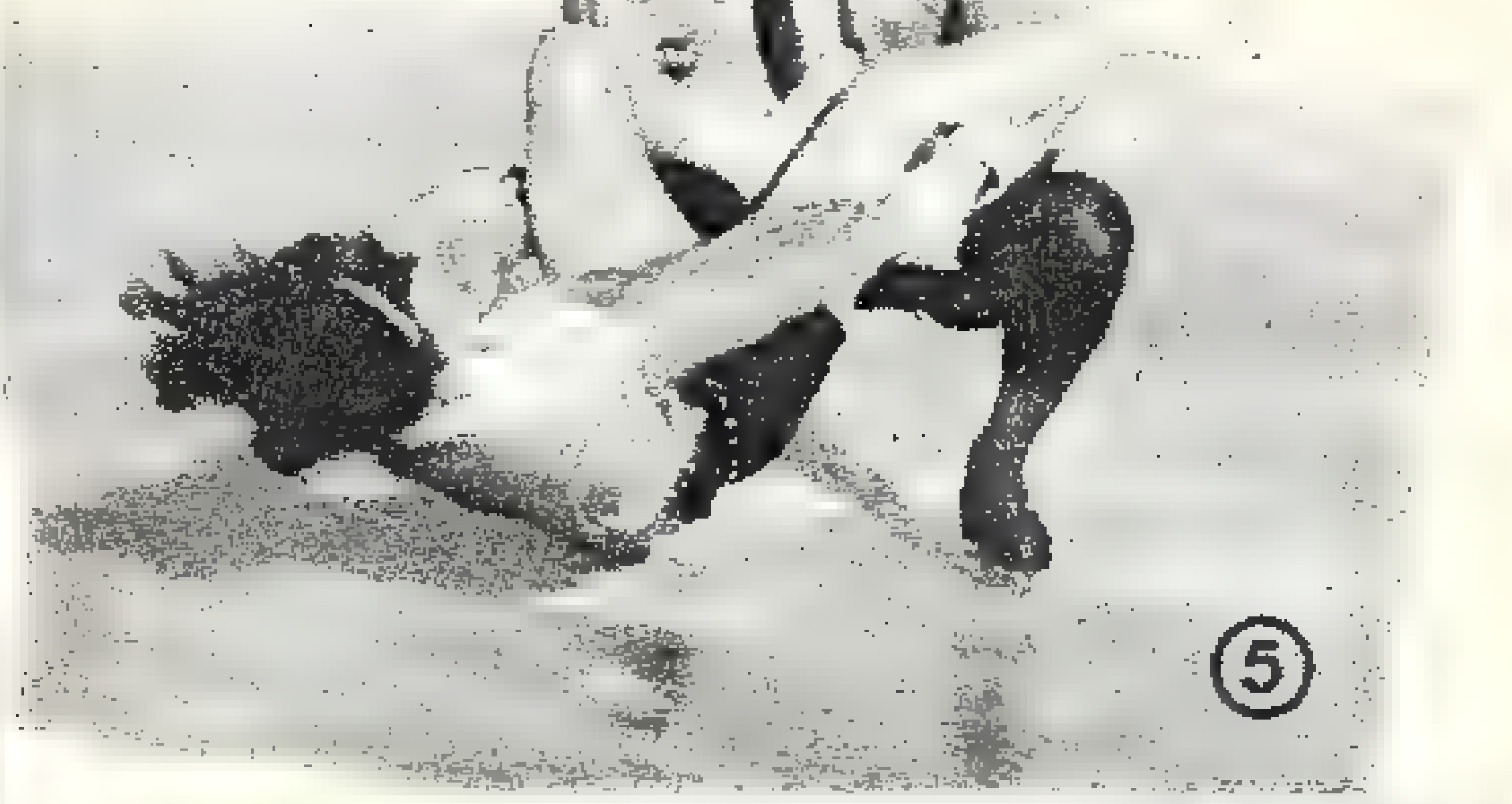
While much of the sound is made vocally, mechanical devices and various materials are also used. One kind of slow-burning fire noise is made by crinkling cellophane, while a more crackling fire sound is gained by twisting a bundle of bamboo strips. A train getting under way is obtained by a tin can in which is a handful of gravel. By shaking the can and gravel up and down, the noise of a real railroad train is created. Another "train noise maker" consists of a number of wires held at one end by hand. The other end of the wires is rubbed over a sheet of corrugated tin. Thunder claps of various kinds are obtained by cowhides and sheets of metal, while wind noises are made by rapidly revolving a wheel with wire spokes. Another hollow ghostly wind noise is made by revolving a wooden drum against taut silk. Rain noises are made in a drum in which are stretched piano wires. Particles of glass dropping against the wire when the drum is revolved creates the sound.

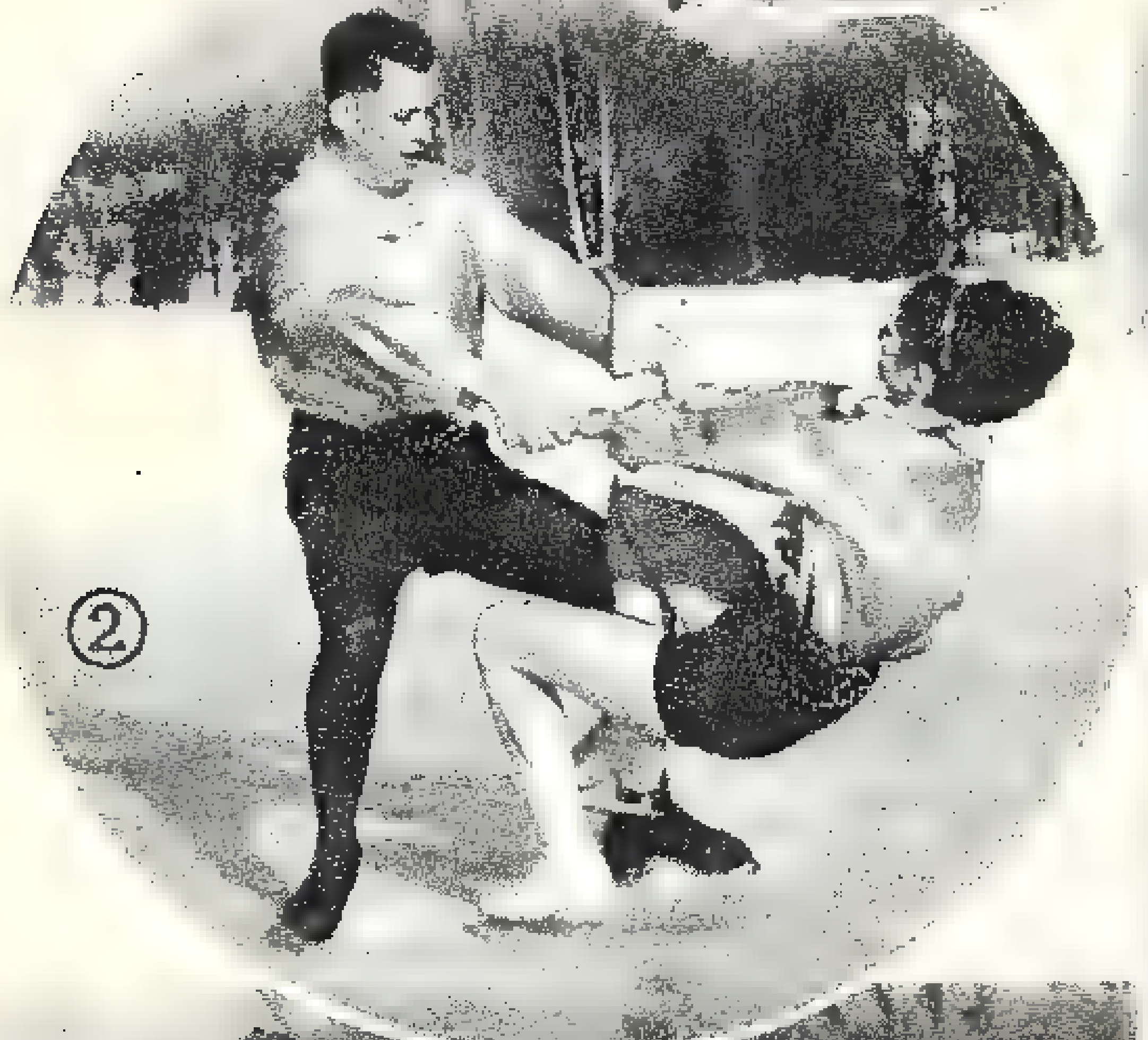
Lion roars are obtained from a barrel over which is stretched, drumlike, a piece of skin. Into the center of this skin is tied a heavy piece of cat-gut and the sound is made by sliding a rosin coated piece of leather down the cat-gut. Dog barks are made by similar though smaller contraptions. Various dog bark pitches are made by using assorted sizes of tin cans. The dog "language" is produced by the manner in which the rosined leather is slid on the string. Often ordinary tools such as egg beaters which furnish machinery noise, derby hats which supply thumping or more exactly a "plop in" sound, and so forth are used for suitable noises.

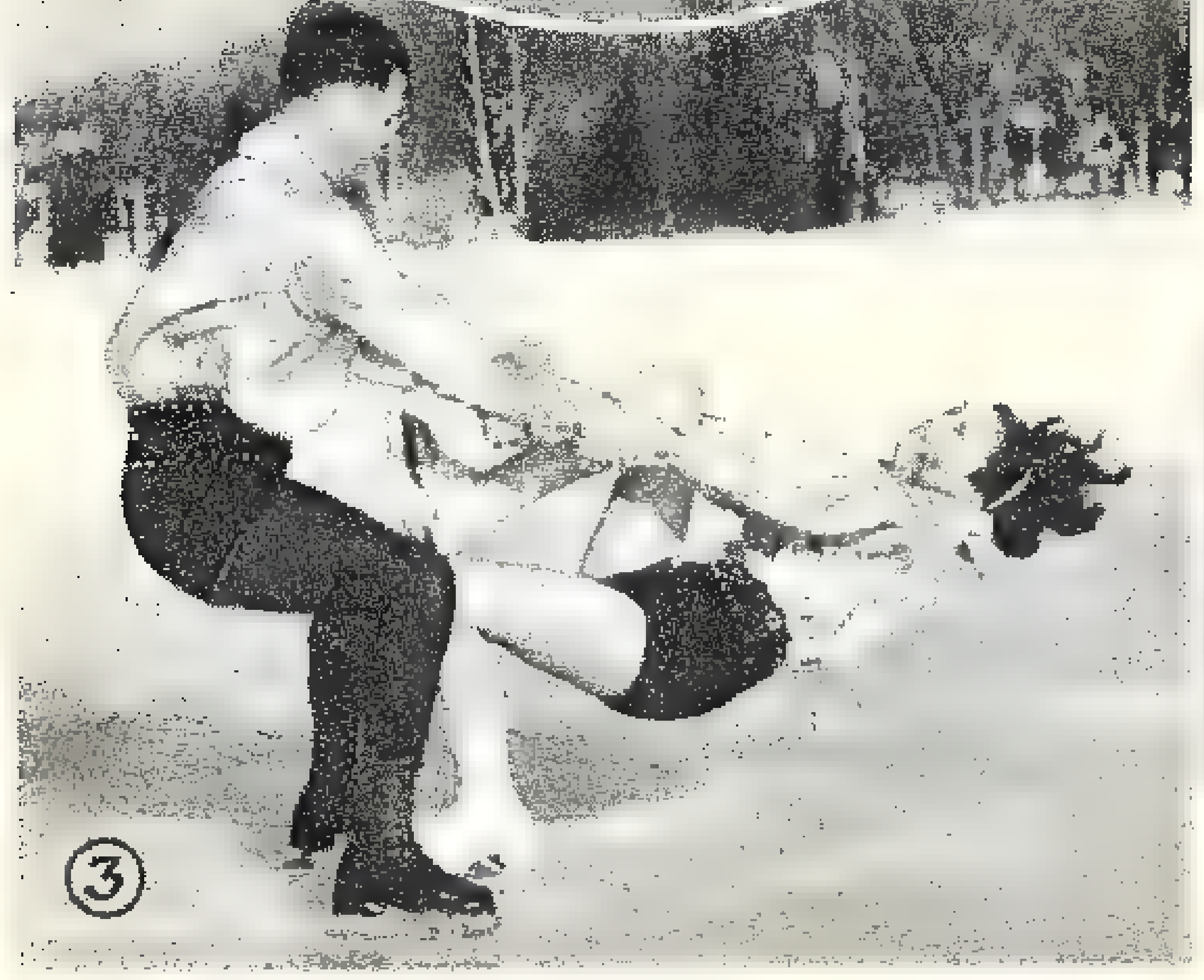
FANCY SKATING

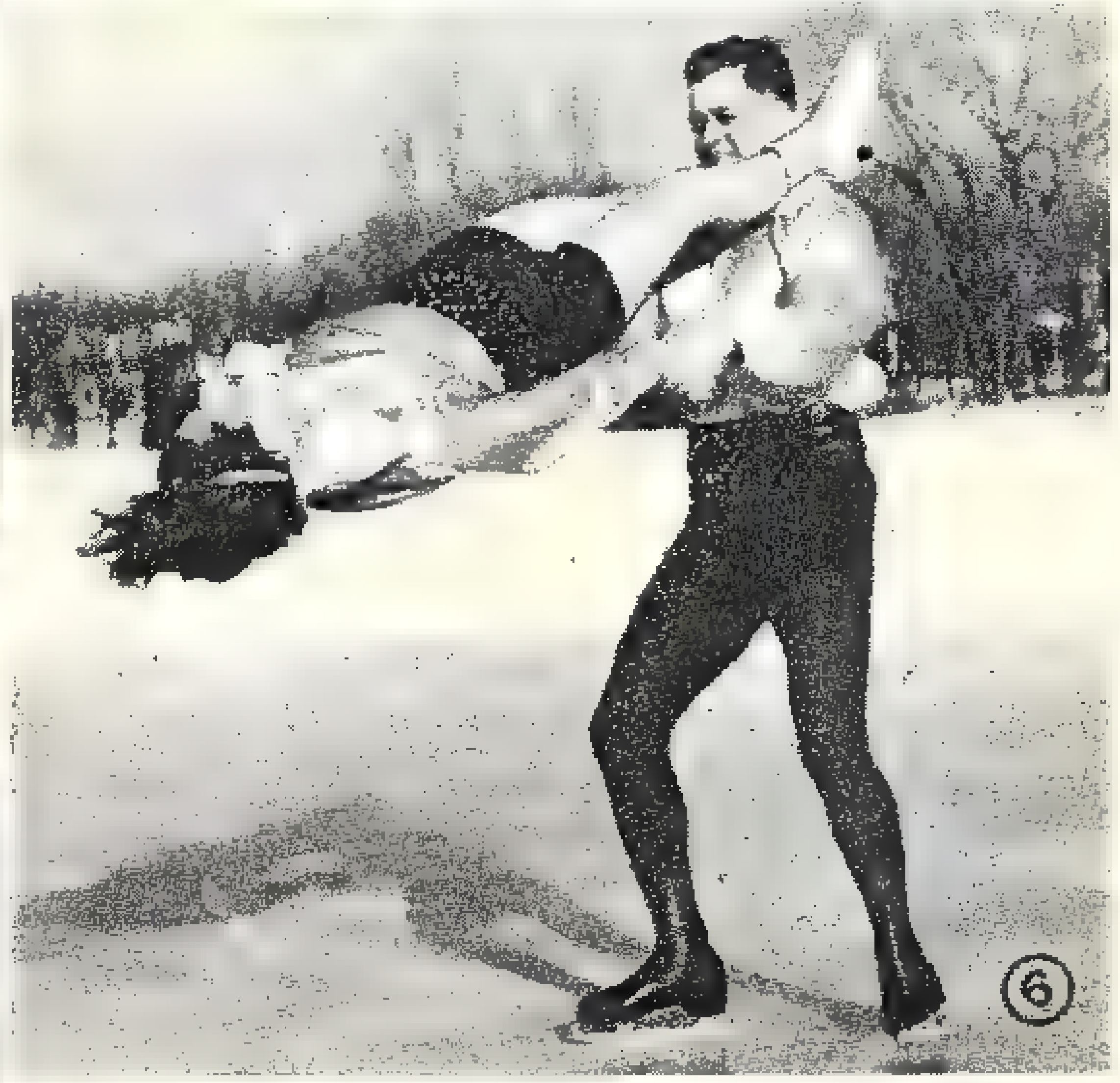

①

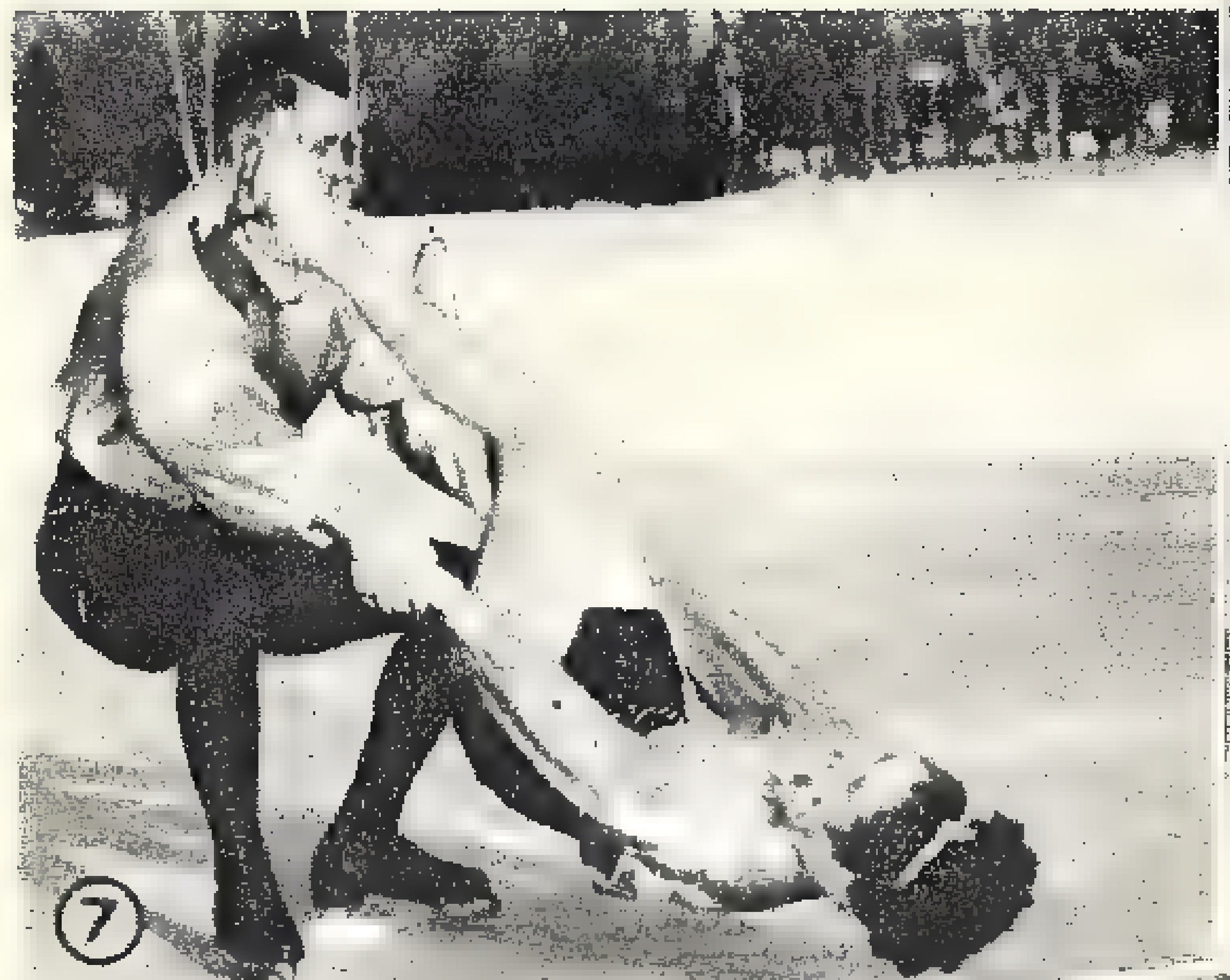

④

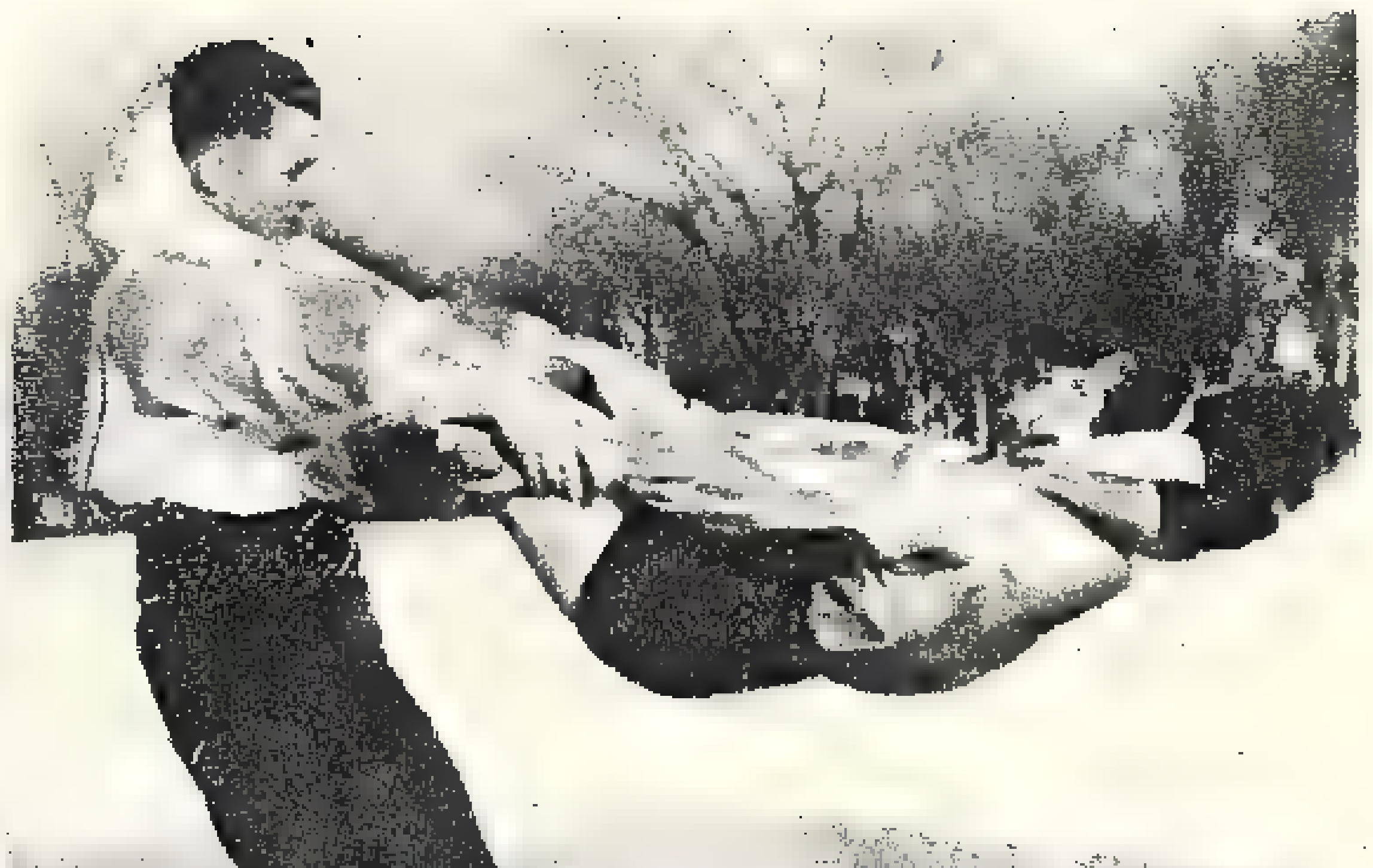

⑤

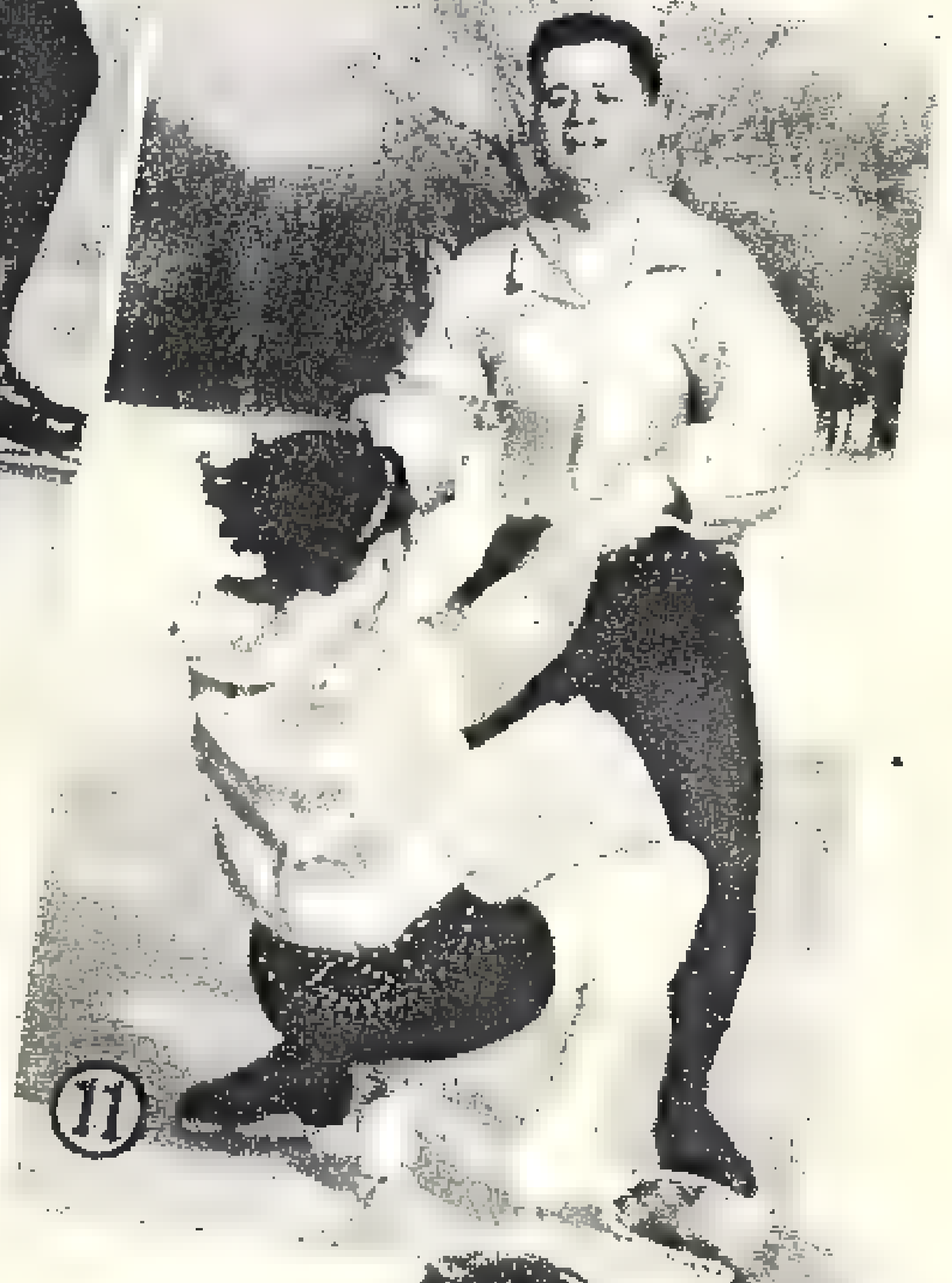

②

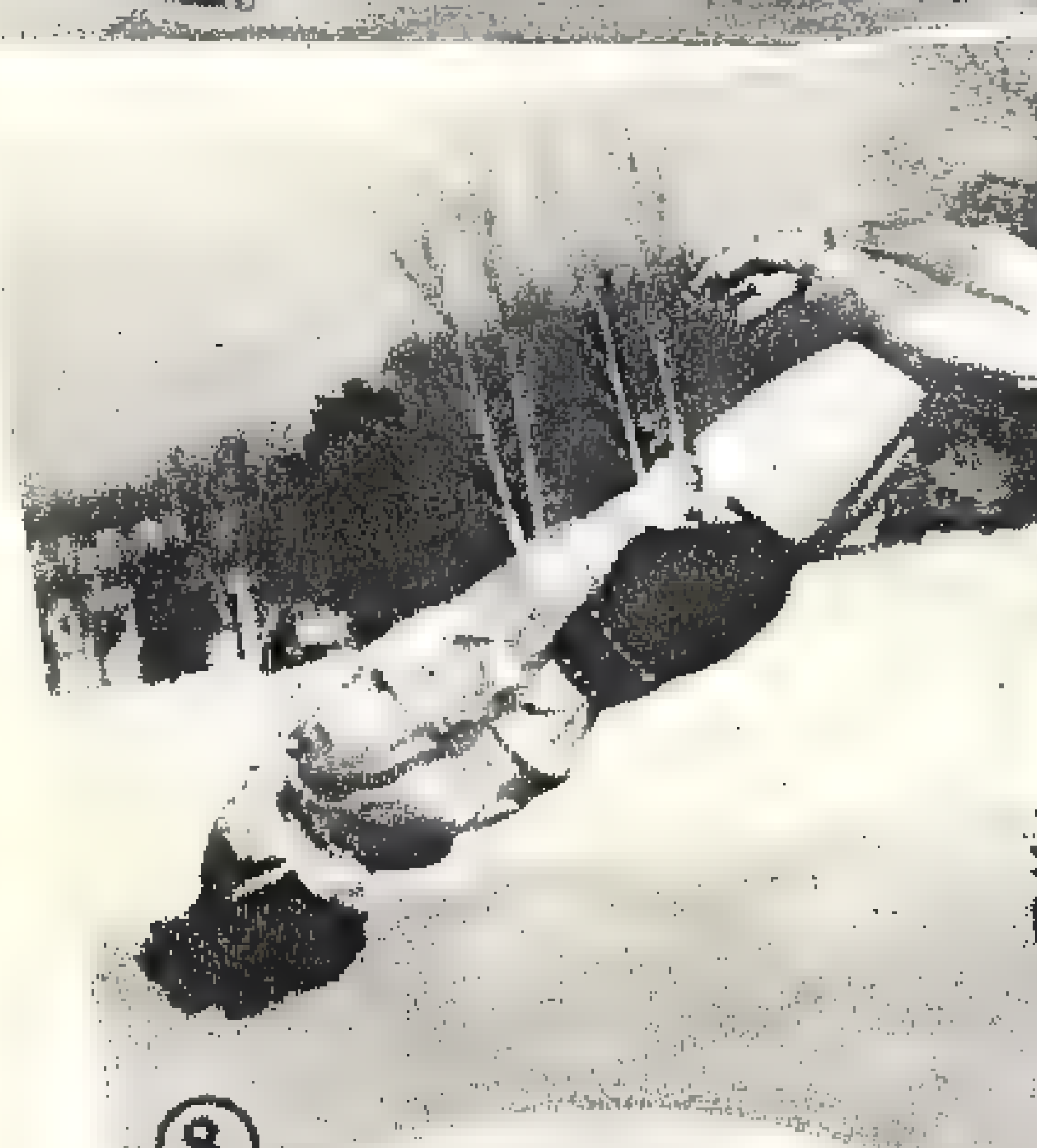

③

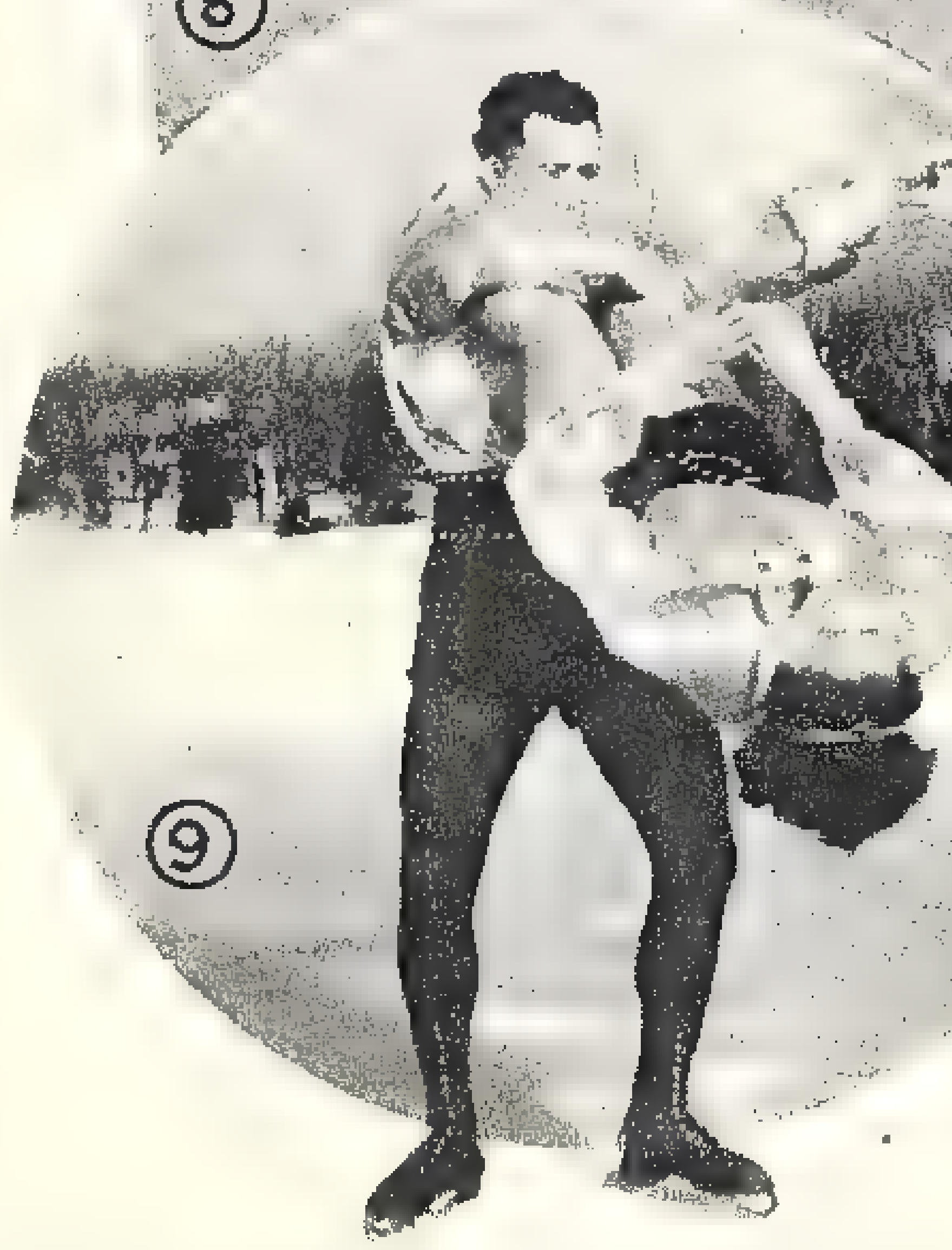

⑥

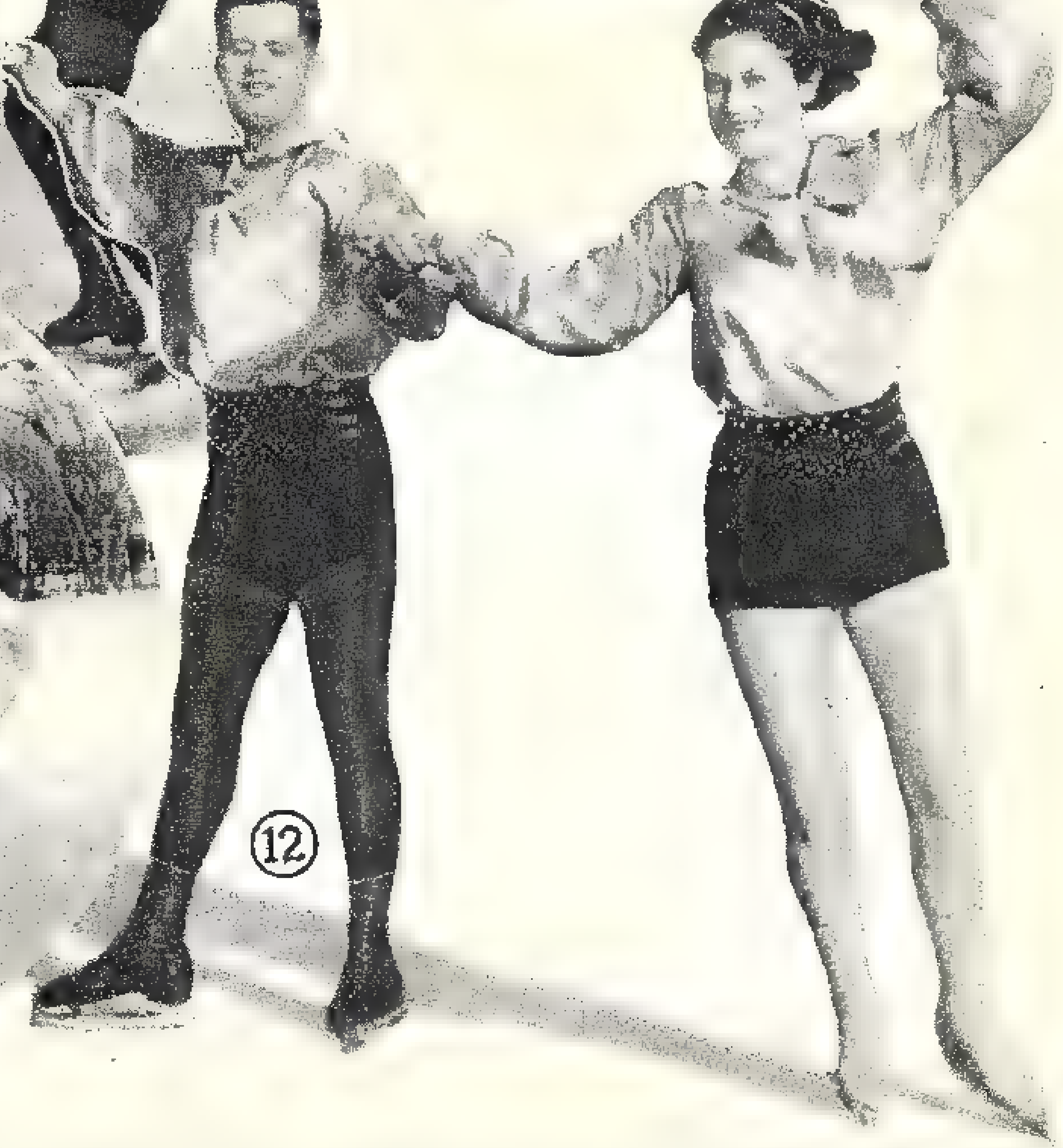

⑦


⑩

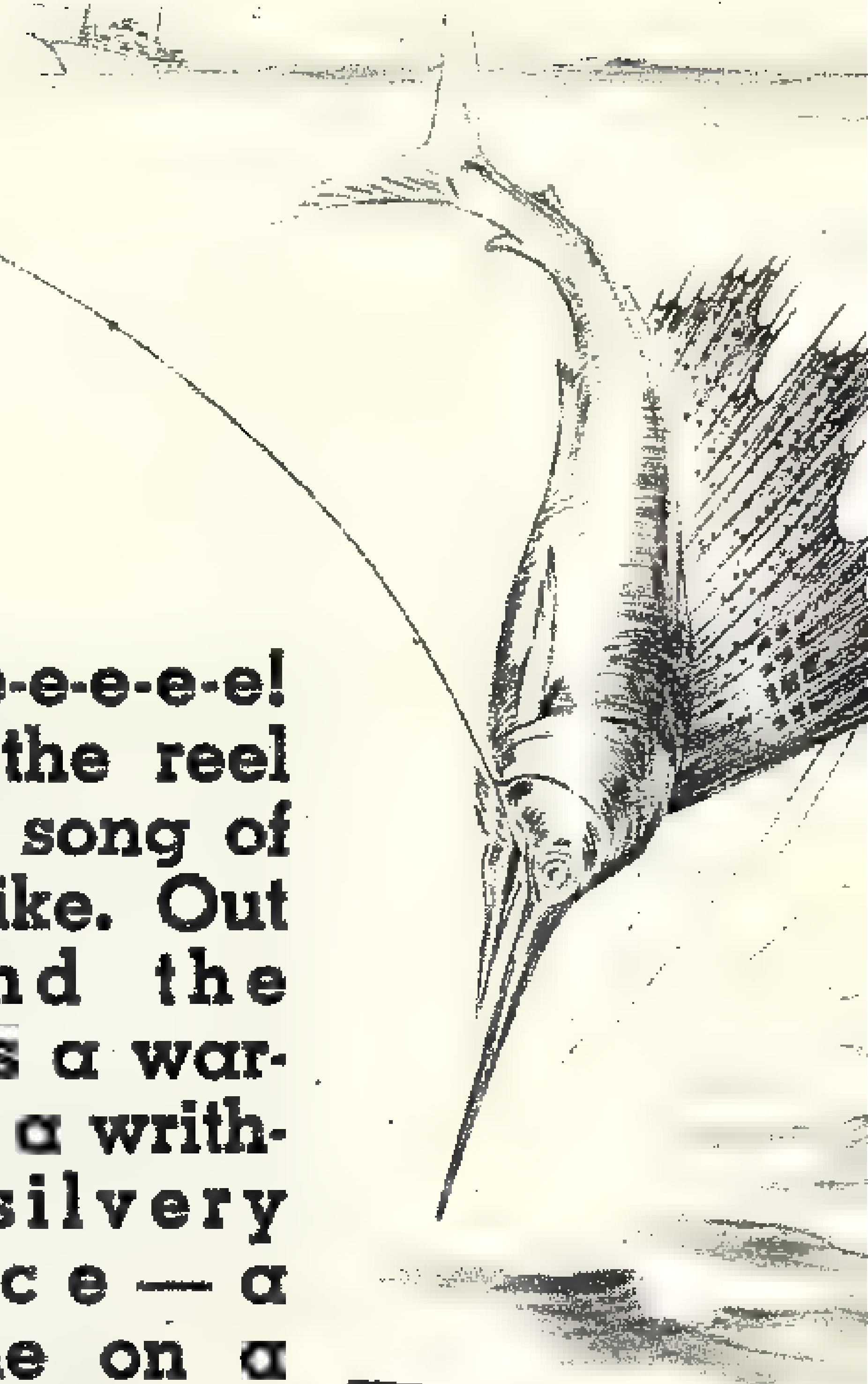

⑪


⑧


⑨


⑫

The skill and grace of star ice skating performers is graphically shown in this series of action photographs taken by George Ryan, Minneapolis (Minn.) *Tribune* cameraman. The photos, taken by a super-speed camera, show Norris and Naome Wold going through the evolutions of the "puck spin" at Lake Of The Isles in Minneapolis. Fancy skating calls for a degree of skill and precision second to that of few other activities. Speed, balance, strength, endurance—all are required of those who would perform on the flashing blades. A slip here, a moment's hesitation there, and what started as a graceful exhibition is turned into an awkward, stumbling display. Constant, painstaking practice is necessary.



TACKLE For Salt Water FISHING

by

Robert Page Lincoln

UNLESS you are familiar with sea fishing the selection of the proper tackle is open to conjecture. There are so many sea fish, all of which fall into many and various divisions such as large, medium and small, some mad tearing and others just a little bit better than very active. All of these species have to be taken into consideration when selecting sea-fishing tackle.

Needless to state the tackle to be used for sea fishing must be picked according to the size of the fish one is after. Obviously the very large fish, such as the marlin swordfish, the sailfish, the tarpon and the tuna (all racy fish of tackle-testing proportions and activity) demands the stoutest and most enduring tackle. For such fish a double enamel tip of 60 inches and a weight of approximately 14 to 16 ounces is a suggestion. The butt length will be 20 inches, or the rod, with butt in place, measuring 6 feet 8 inches over all. With a rod of the sort a 9-0 reel or heavier is a suggestion. A 36 to 38-thread cuttyhunk line is often used although lighter lines are selected by those practiced in the use of medium weight tackle.

Medium weight tackle is used in the taking of such fish as the barracuda, the amberjack, the great kingfish, California yellowtail, crevalle and others. *The rods for this* purpose should range from 10 to 14 ounces, with a 6-0 reel to keep it company. A 24 to 30-thread cuttyhunk line is a practical suggestion. A double enamel rod is not needed for this department, the single enamel rod being suitable and not too light. A tip in this class weighing 9 ounces has a length of 60 inches.

A lighter rod, one ranging 7 to 10 ounces in weight will take a 4-0 reel, with a cuttyhunk linen line of from 15 to 21 threads. A rod of the sort will handle with ease all fish less in weight than the species listed in the second class. Incidentally, let it be mentioned that in this third class of sea fish, in which will be found the mangrove snappers, the Spanish mackerel, the bluefish, the sea trout, the channel bass, the smaller croakers, the robalo, the sheepshead, and others, the common, everyday bait rod and black bass fishing tackle such as is used in inland fishing is now much in vogue. In fact, there is an ever-increasing disposition on the part of anglers to invade even the ranks of the class

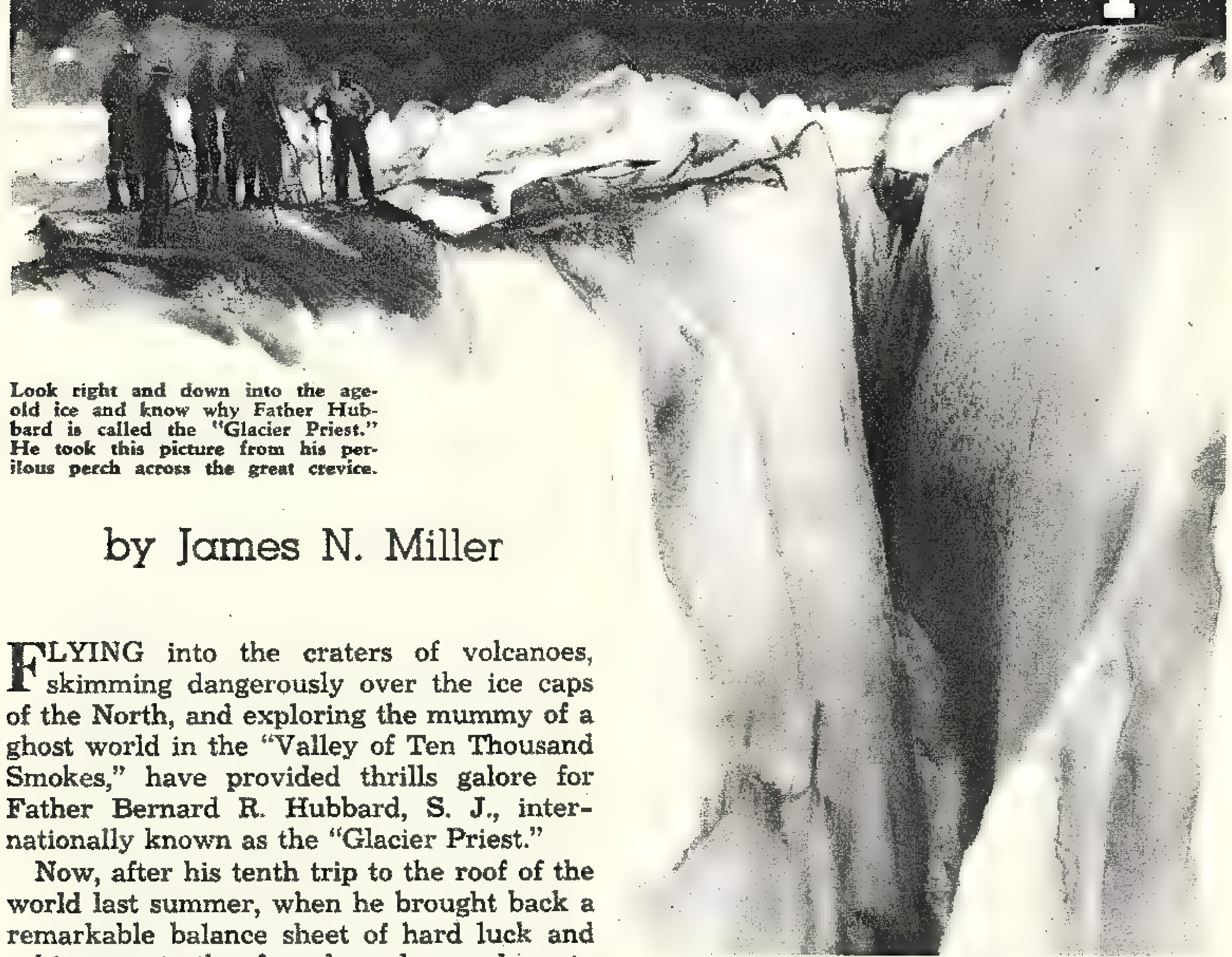
Whe-e-e-e-e-e! sings the reel in the song of the strike. Out behind the boat is a warrior in a writhing, silvery dance—a cyclone on a leash!

Circle—Hooking a tarpon is synonymous to roping a wild mustang. When the strike occurs, the great fish leaps high out of the sea in efforts to shake off the hook, then the fight is on. Below—A sextette of big ones soon to become swordfish fillets. In Southern California waters, where these pictures were taken, monster, man-eating sharks often bite chunks from the fish before it can be hauled aboard the boat.

Sometimes a young hammerhead shark gobbles up the bait, as shown above. To cut the hook from the mouth of this detestable fish often results in a skinned arm or hand, for sharks have sandpaper skin. Below—A proud man poses with a 200-pound marlin swordfish which he caught in the Gulf of Mexico.

GLACIER PRIEST Maps ROOF of the WORLD

Soaring over craters, jumping bottomless pits edged with rotten ice, frozen by gales, feet frying in volcanic heat—these are experiences of Father B. Hubbard.



Look right and down into the age-old ice and know why Father Hubbard is called the "Glacier Priest." He took this picture from his perilous perch across the great crevice.

Magook, Father Hubbard and Wolfe—the three pals who fought the dangers of six Alaskan expeditions together. And last summer, when a mother huskie gave birth to seven woolly pups, Magook and Wolfe toted the babies in addition to their 50 lb. packs.

Off Bogsolof, Father Hubbard attempted to make a 4-ton sea lion into a movie actor, but was rebuked with angry barks and a lumbering chase that threatened to crush the nearby cameras and scientific apparatus. A full-grown sea lion is no man's friend.

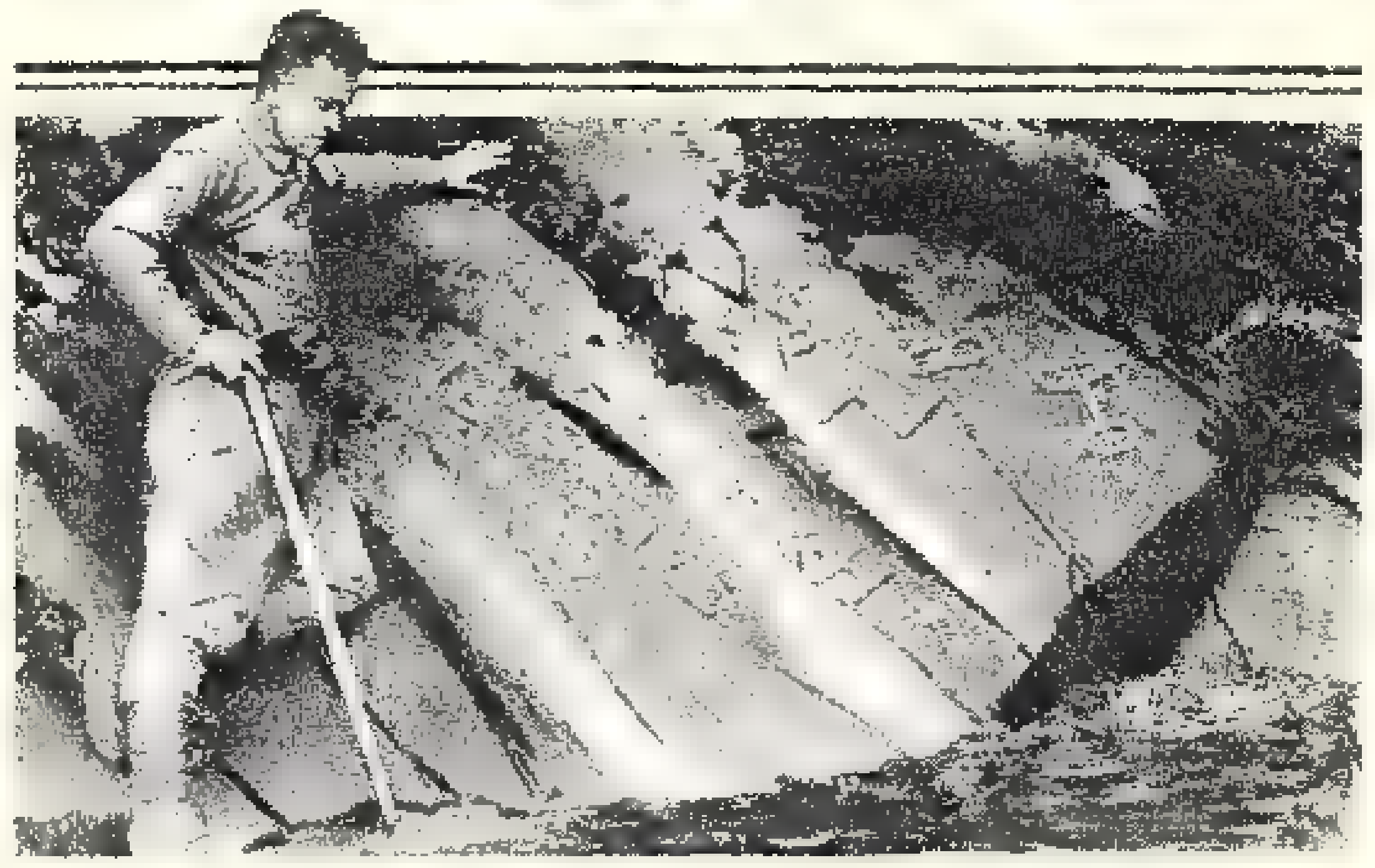
by James N. Miller

FLYING into the craters of volcanoes, skimming dangerously over the ice caps of the North, and exploring the mummy of a ghost world in the "Valley of Ten Thousand Smokes," have provided thrills galore for Father Bernard R. Hubbard, S. J., internationally known as the "Glacier Priest."

Now, after his tenth trip to the roof of the world last summer, when he brought back a remarkable balance sheet of hard luck and achievement, the famed explorer plans to turn from the study of geology—the science of rocks—to the study of primitive human beings.

For, while pondering the mysteries of the birth of storms that influence the four seasons of the year in the United States for better or for worse, Father Hubbard believes he has also fathomed the origin of man in America, who came to this continent on a newly discovered ancient road from Asia.

Father Hubbard believes that his last trip, the tenth in a successive series, was the most important of all. He found that the Taku ice-cap, near Juneau, one of the southernmost formations of its kind, is receding and exposing a fossil glacier of the last Ice Age. Nearby, he said, the Taku glacier was half aground and will soon cease breaking off icebergs, and Twin glacier has receded a mile and is wholly aground. This means the tremendous flow of icebergs that consitutes an ever-present menace to shipping hundreds of miles to the south, soon will be a hazard of the past.



Does this rock writing mark the road by which ancient man first came into America from Asia? Father Hubbard (above) believes so, claiming many came in over this chain of Aleutian Islands, although the main route was by the Bering Sea.

Viewing the immense Taku ice-cap last summer for the first time in ten years, the Glacier Priest reported:

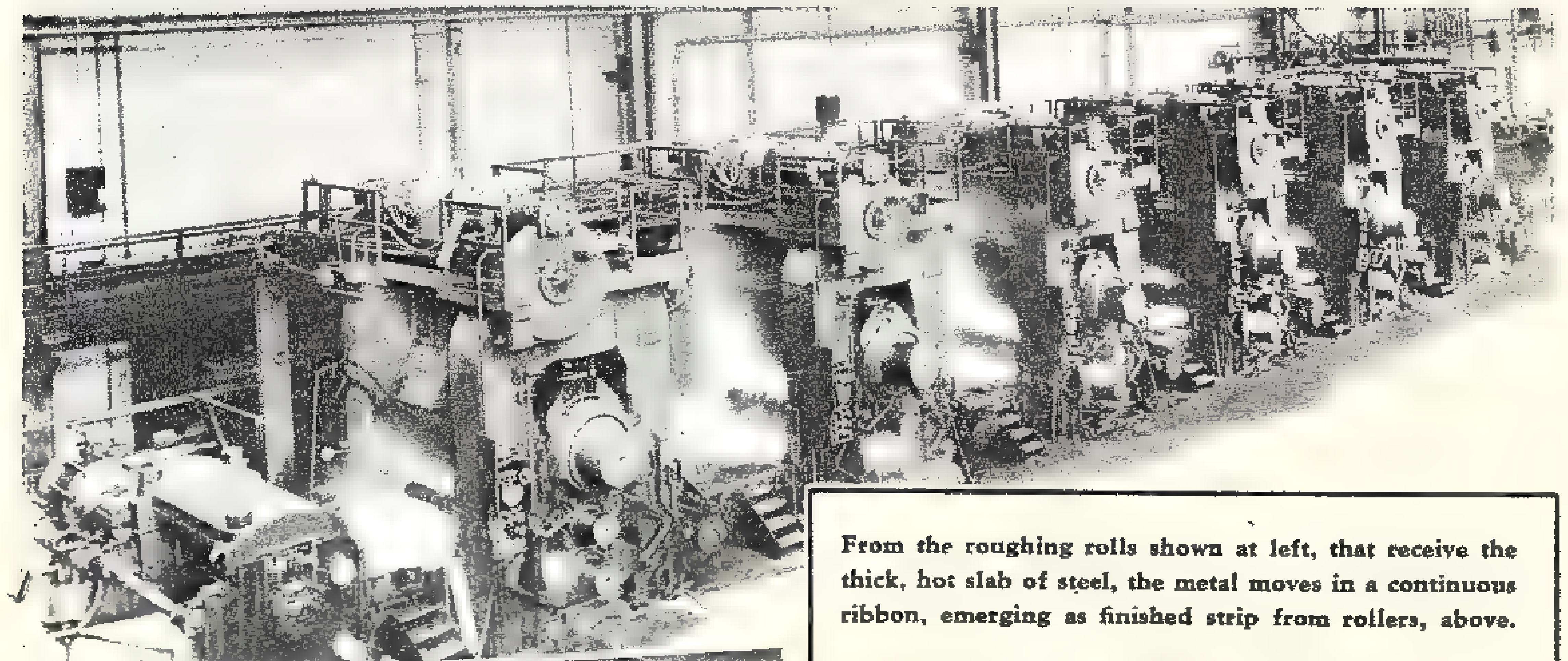
"The vast ice mass is shrinking, which proves that the earth is still in a recessional ice age. On Taku ice-cap many new mountains, called Nuntakas, as well as long, rocky ridges have appeared where I saw only crevassed ice ten years ago, Taku glacier and the lobes of Twin glacier have retreated. The Mendenhall glacier has been melting back and is exposing a fossil glacier underneath the present one. The hundreds of square miles of this ice-cap and its many glacier tongues are a new layer of ice hundreds of feet thick lying on top of a remnant of the last ice age, which is a fossil body of ice entirely different in crystal form. It appears here and there as the upper layer melts."

Father Hubbard and his party found landlocked icebergs in Twin glacier lake, the bottom of which is 600 feet below sea level. The icebergs float there the year round, and keep the water near freezing temperatures.

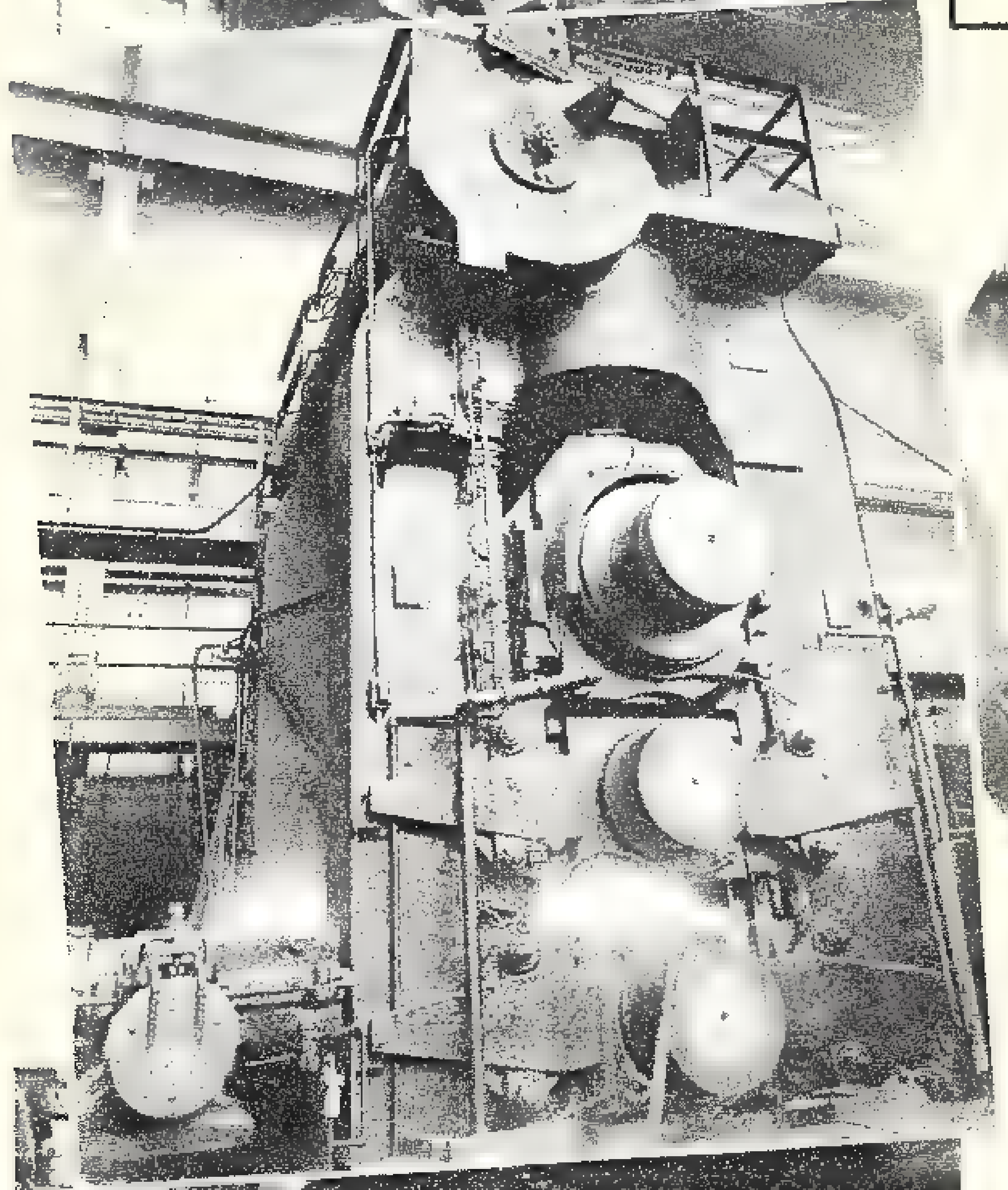
Nicholas Cavalierre, of New Haven, Conn., a member of the Hubbard party, took 50,000 feet of motion pictures of the Taku region. The year before, on the ninth expedition, the party also took 30,000 feet of film of action "shots" of glaciers of a spectacular type never before filmed—showing enormous mountains of ice tearing away from the glacier mother to strike the sea below with a terrific roar and splash. These "shots" were made on the final 60-mile lap of exploration of the entire 600 miles of the Alaskan Peninsula and adjacent islands, and were taken from a small steamer anchored alongside Hubbard glacier in Disenchantment bay, southeastern Alaska.

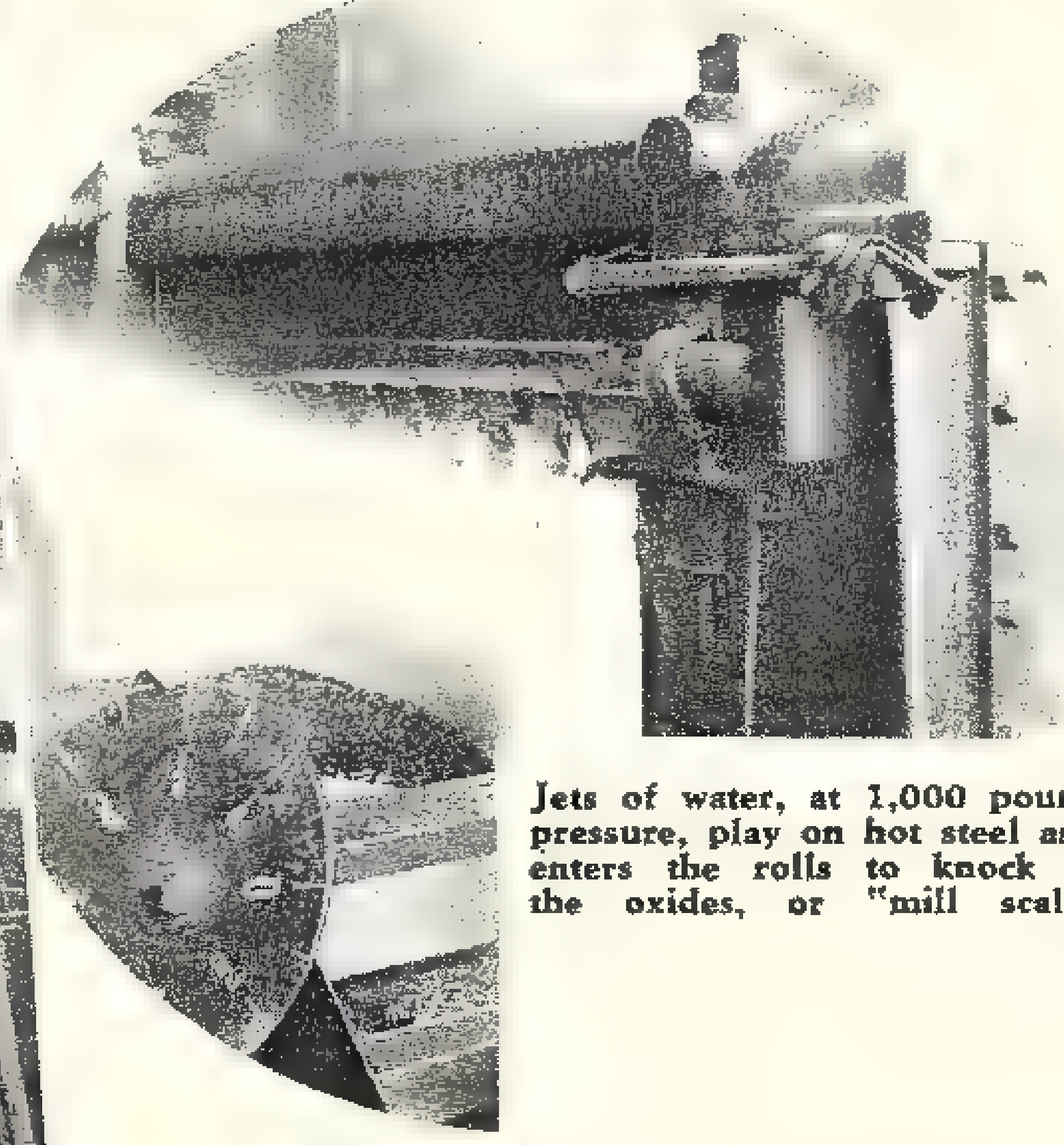
[*Continued on page 128*]

BETHLEHEM Opens New $20,000,000 MILL

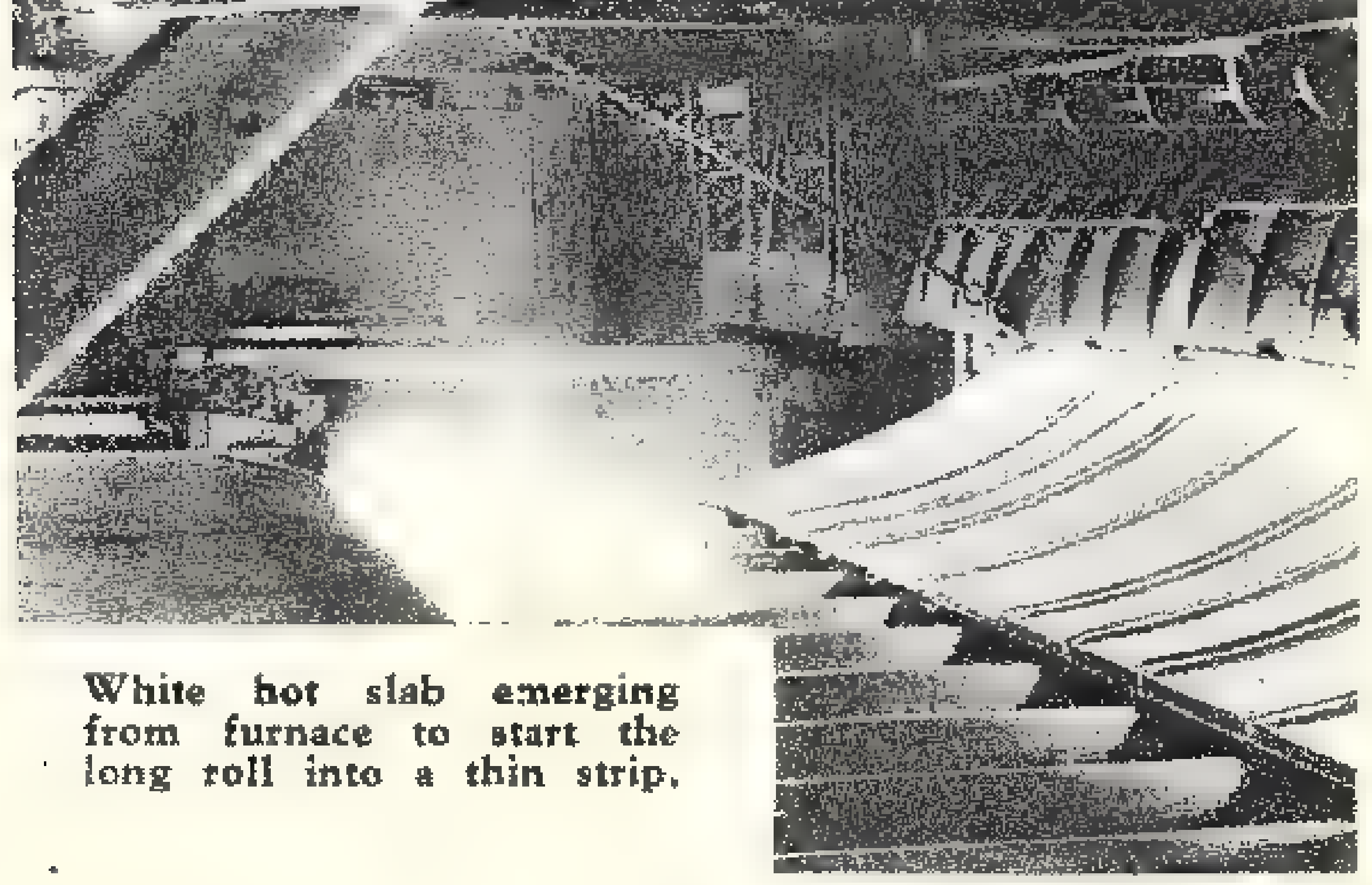


From the roughing rolls shown at left, that receive the thick, hot slab of steel, the metal moves in a continuous ribbon, emerging as finished strip from rollers, above.





Jets of water, at 1,000 pounds pressure, play on hot steel as it enters the rolls to knock off the oxides, or "mill scale."



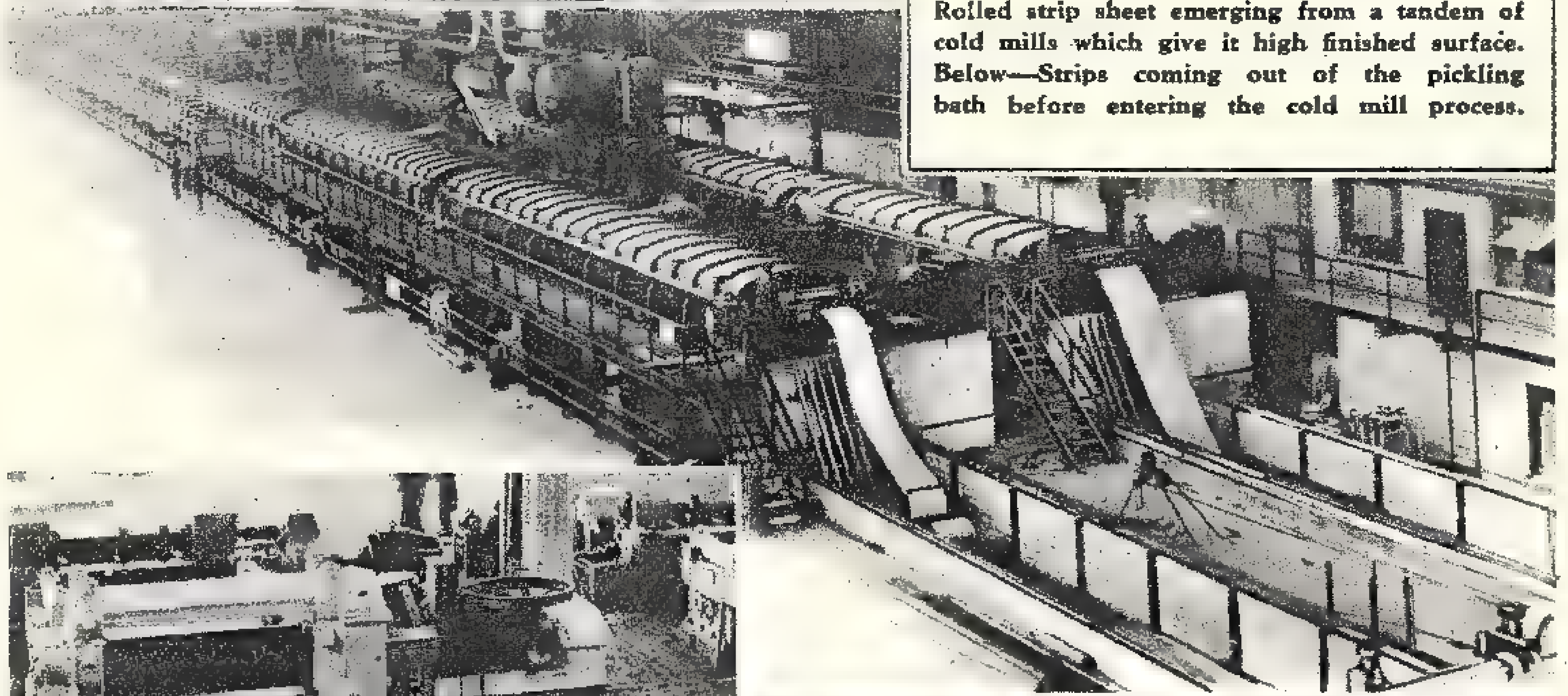
White hot slab emerging from furnace to start the long roll into a thin strip.

by Watson Davis

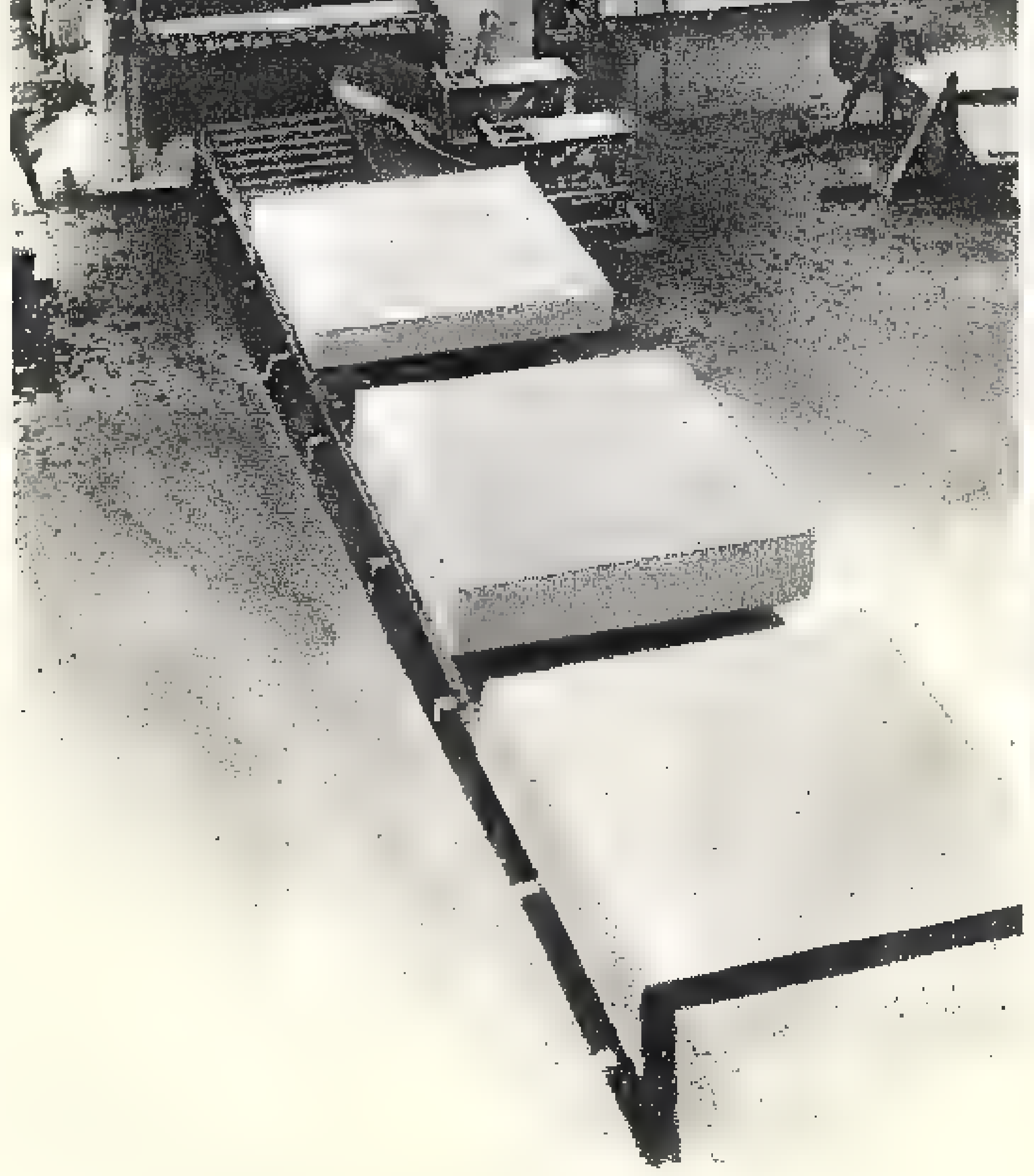
MAN and machine reach new heights of co-ordination in a new $20,000,000 steel strip mill of the Bethlehem Steel Co., at Lackawanna, N. Y., near Buffalo. Human brains and skill, both in design and operation, combine with precise and delicate control of large electrical power to roll a thick slab into a lengthy strip of sheet metal in a few minutes.

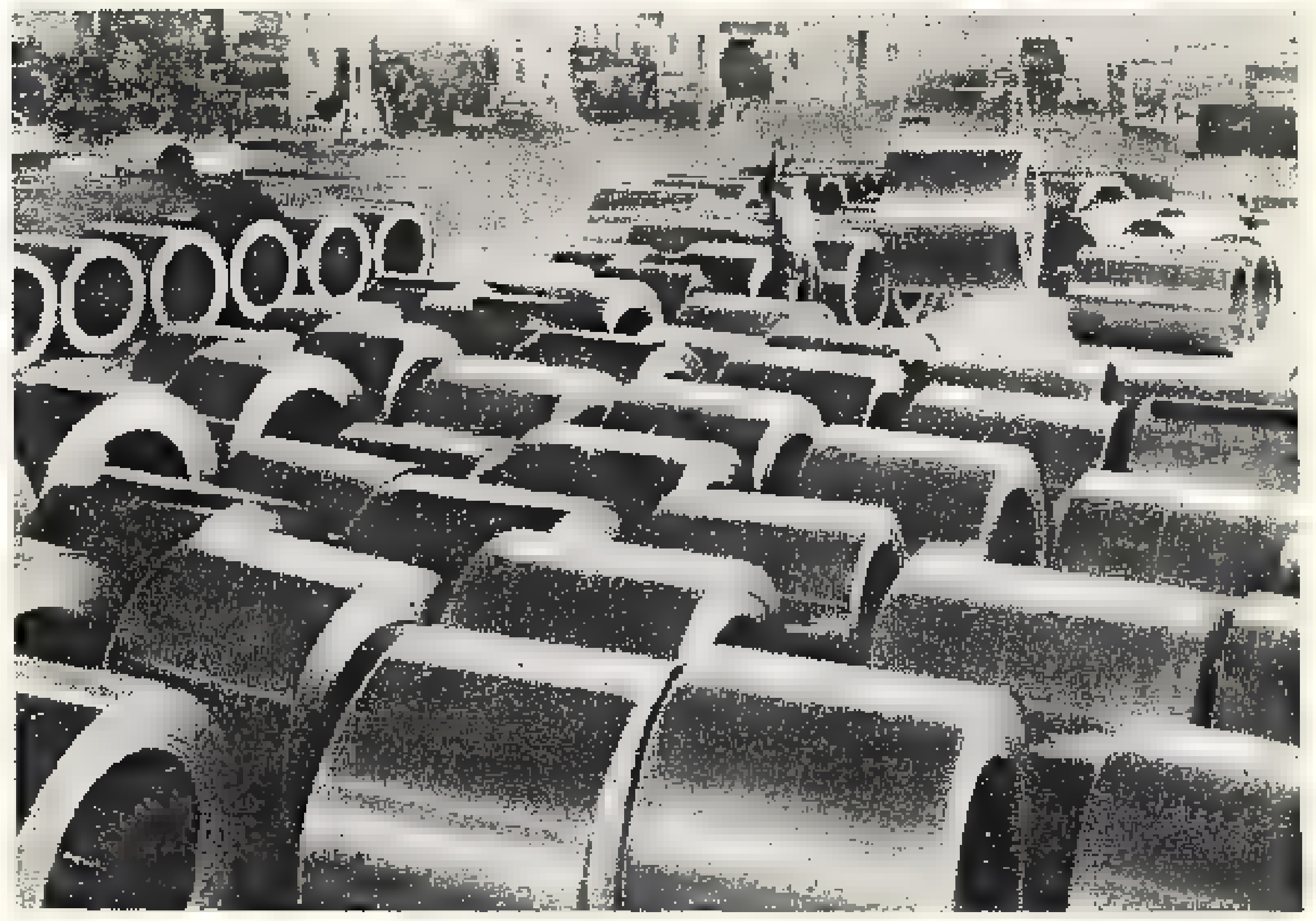
To see a red-hot chunk of steel pass successively through eleven huge sets

[Continued on page 128]



Rolled strip sheet emerging from a tandem of cold mills which give it high finished surface. Below—Strips coming out of the pickling bath before entering the cold mill process.



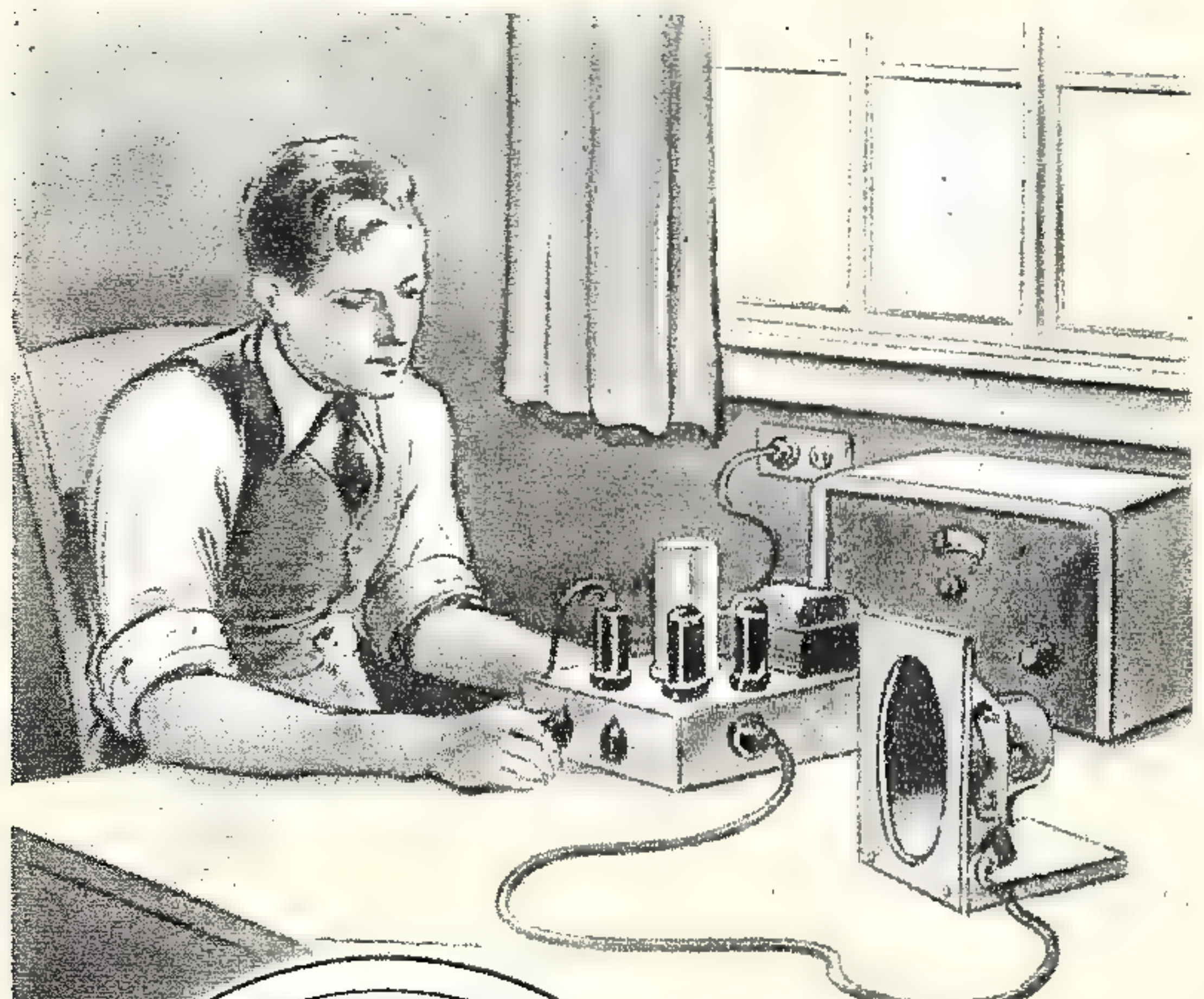


The finished product ready for cold-forming into auto bodies and hundred-and-one other products. It is shipped in flat sheets, as at left, and in coils weighing tons each.

TINY AMPLIFIER FEATURES METAL TUBES

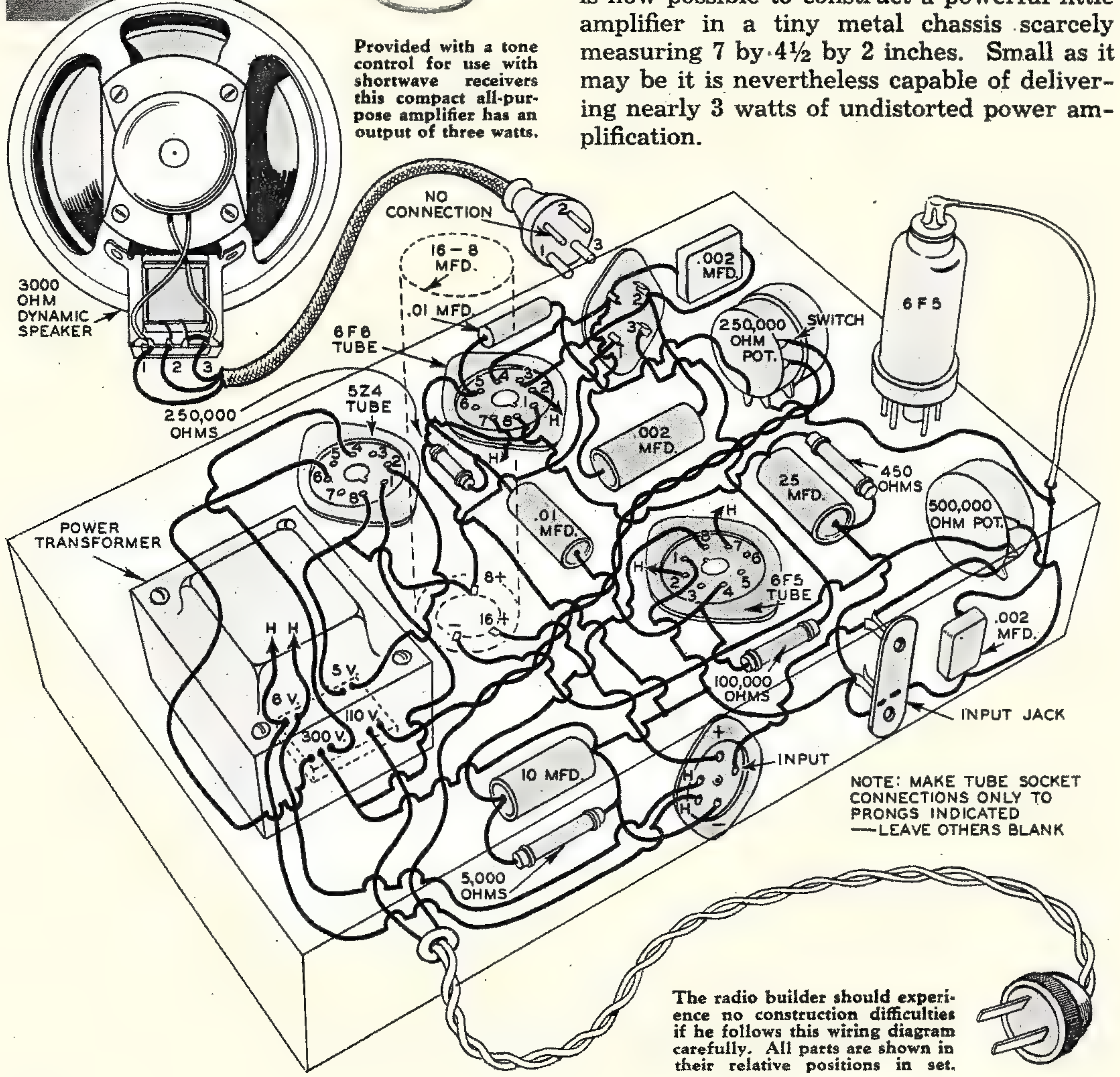
by Wm. J. Vette

This compact metal tube amplifier provides both B power and speaker volume for small sets.

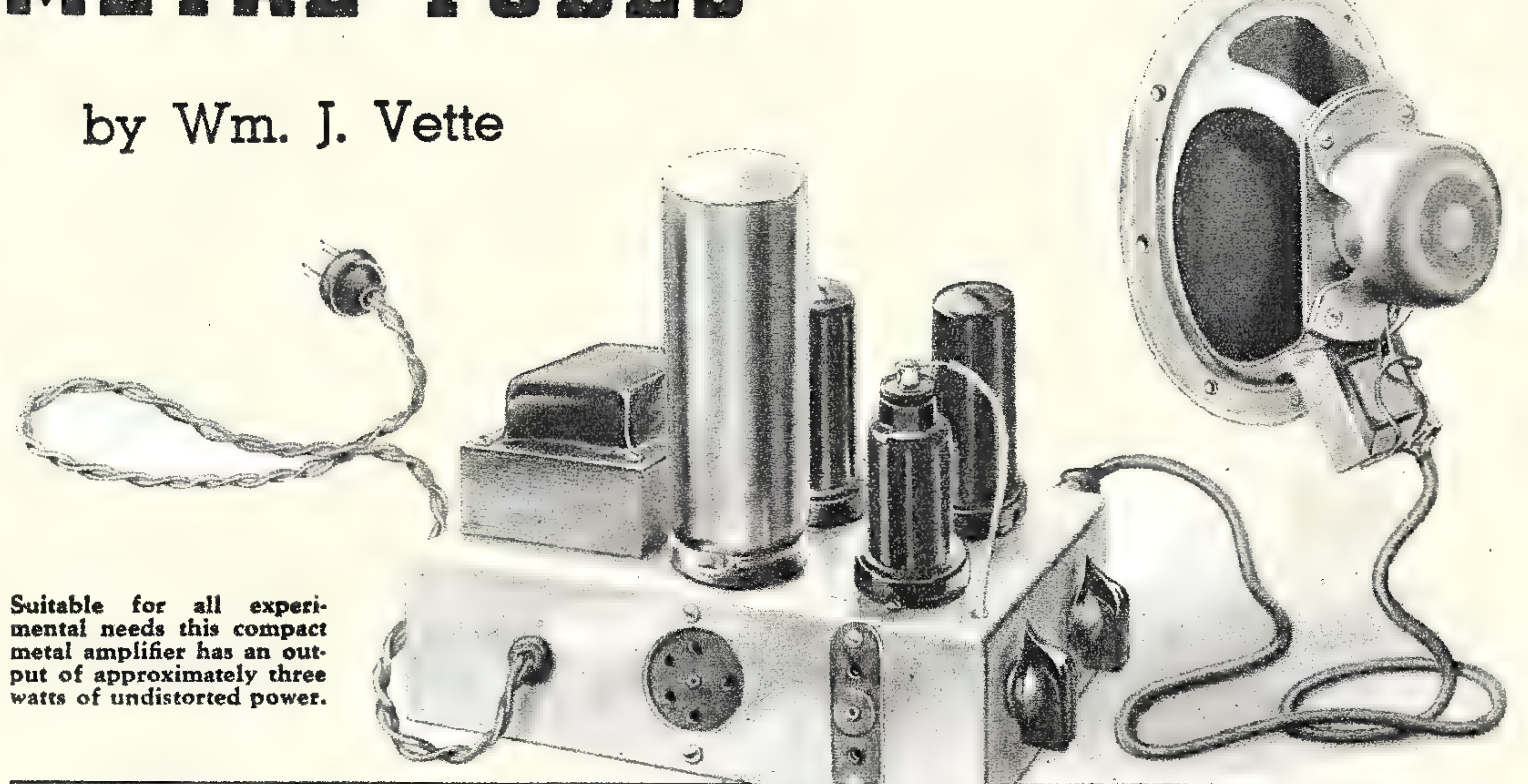


Provided with a tone control for use with shortwave receivers this compact all-purpose amplifier has an output of three watts.

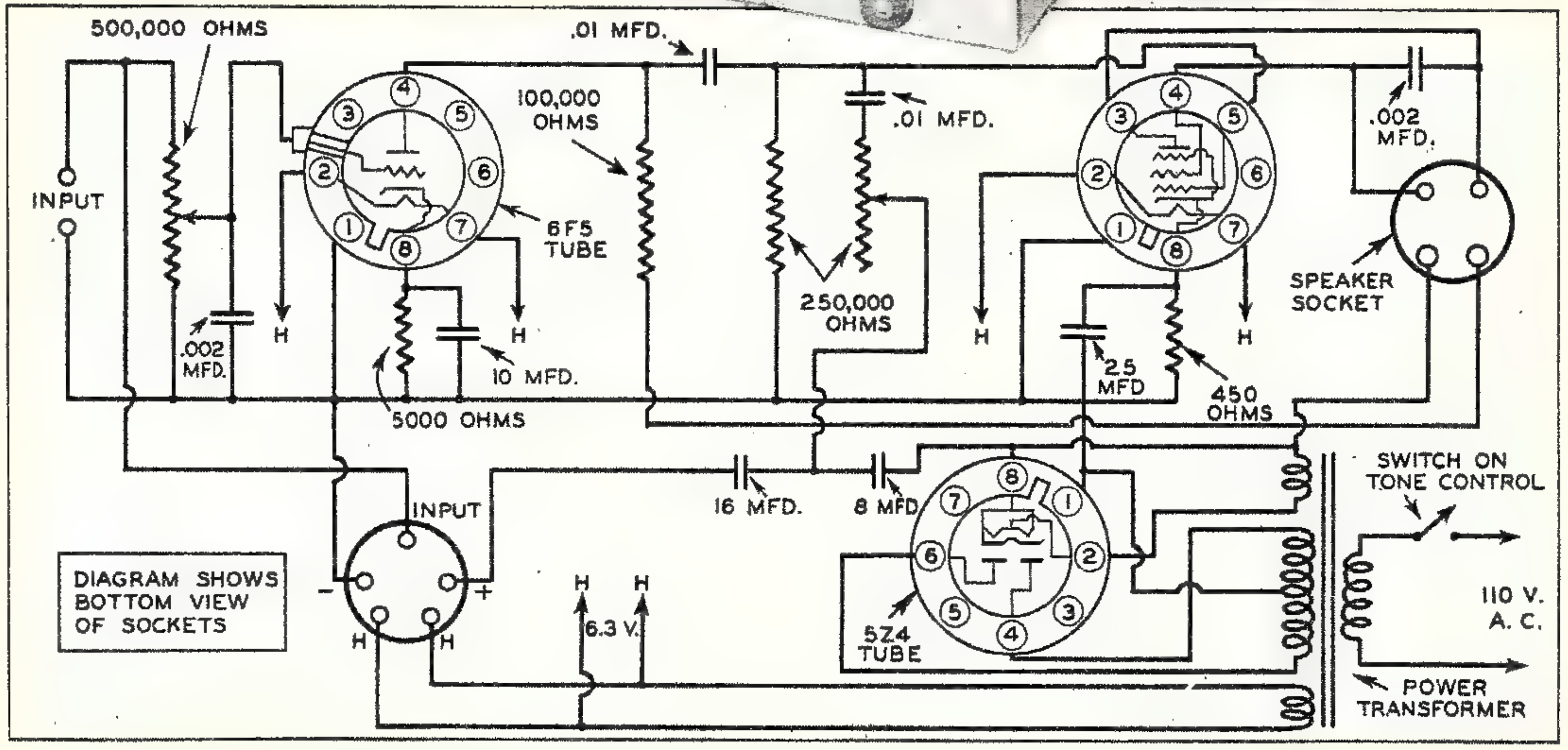
EVERY radio experimenter has occasion at some time to use an amplifier; especially if he owns a small two or three-tube short wave receiver. Until a few years ago any amplifier that had the least bit of output was a bulky affair weighing at least 25 pounds. With the improvements in radio design which have been made during the last few years it is now possible to construct a powerful little amplifier in a tiny metal chassis scarcely measuring 7 by 4½ by 2 inches. Small as it may be it is nevertheless capable of delivering nearly 3 watts of undistorted power amplification.


3000 OHM DYNAMIC SPEAKER
NO CONNECTION
16 – 8 MFD.
.01 MFD.
6F6 TUBE
.002 MFD.
250,000 OHM POT.
SWITCH
6F5
5Z4 TUBE
250,000 OHMS
.002 MFD.
2.5 MFD.
450 OHMS
500,000 OHM POT.
POWER TRANSFORMER
.01 MFD.
6F5 TUBE
8+
16+
H H
6 V.
5 V.
110 V.
300 V.
.002 MFD.
100,000 OHMS
INPUT JACK
10 MFD.
INPUT
5,000 OHMS
NOTE: MAKE TUBE SOCKET CONNECTIONS ONLY TO PRONGS INDICATED —LEAVE OTHERS BLANK

The radio builder should experience no construction difficulties if he follows this wiring diagram carefully. All parts are shown in their relative positions in set.



Suitable for all experimental needs this compact metal amplifier has an output of approximately three watts of undistorted power.


500,000 OHMS
.01 MFD.
100,000 OHMS
.01 MFD.
.002 MFD.
INPUT
6F5 TUBE
.002 MFD.
H
10 MFD.
H
5000 OHMS
250,000 OHMS
H
2.5 MFD
450 OHMS
H
SPEAKER SOCKET
SWITCH ON TONE CONTROL
16 MFD.
8 MFD.
INPUT
DIAGRAM SHOWS BOTTOM VIEW OF SOCKETS
H H
6.3 V.
5Z4 TUBE
110 V. A. C.
POWER TRANSFORMER

If this schematic wiring diagram is followed along with the pictorial hook-up there is little chance for errors to occur. Note that the tube prongs are not all connected in the circuit since some are blank. Tube sockets, above, show the connections as they appear from the bottom of socket; pictorial diagram shows top view.

The construction is begun by forming the chassis from a sheet of alloy metal or aluminum. Of course, sheet iron may be used but it is more difficult to handle. After punching out the holes for the tube sockets, assemble the sockets and proceed to wire up the various parts. Work can be simplified if the pictorial and schematic diagrams are carefully studied before any actual construction is started.

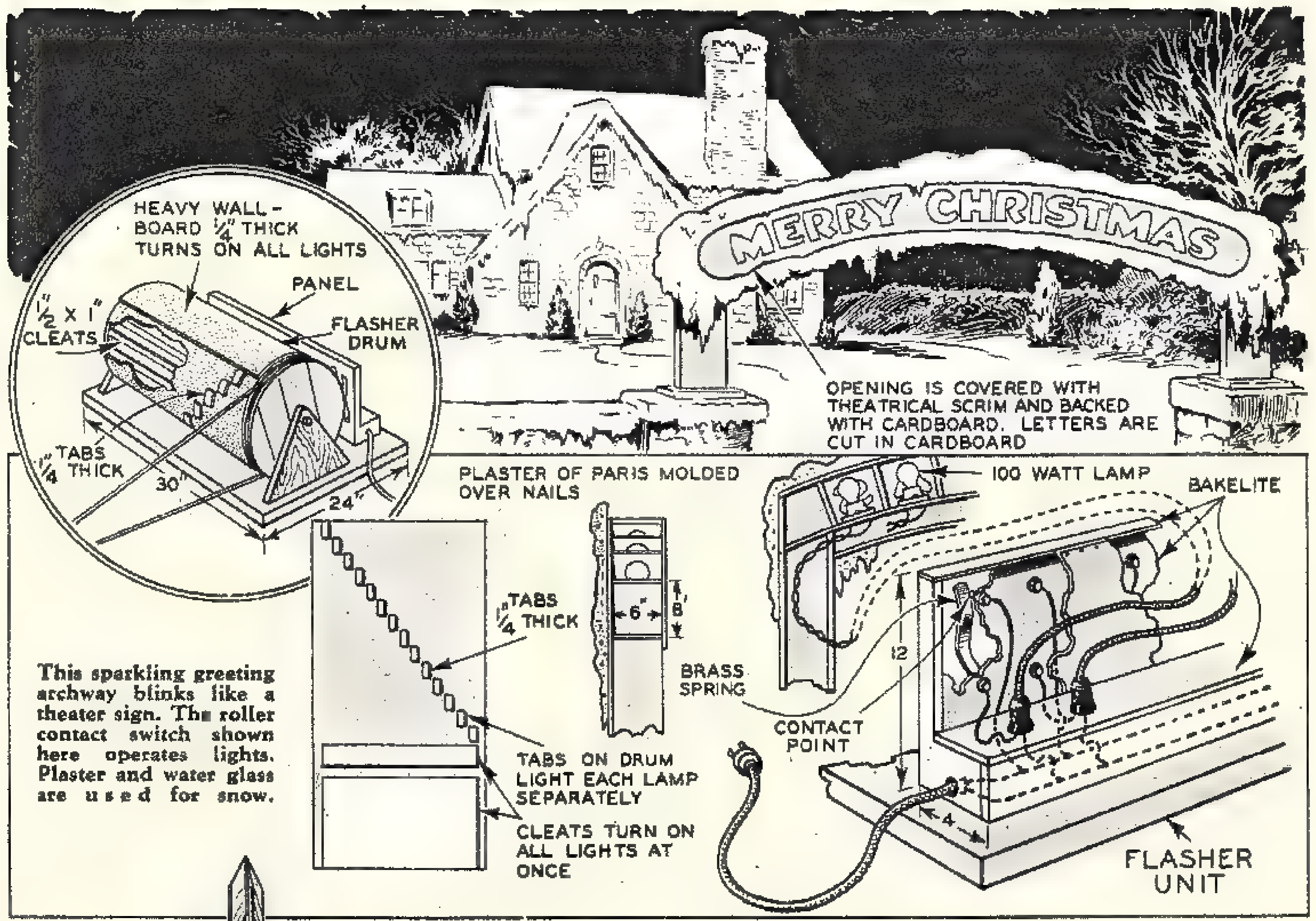
Examination of the circuit will reveal the use of three metal type tubes. A type 6F5 tube is used in the input, a type 6F6 in the output and a type 5Z4 rectifier tube in the power supply circuit. By wiring up these tubes according to the numbers appearing on the prongs in both the pictorial and schematic diagrams no difficulties will be encountered.

In order to operate the amplifier at its peak efficiency a novel code tone control is employed. One potentiometer serves as code tone control while the other is used to regulate volume. The volume control is fitted with an A. C. switch so that one control turns on the power and regulates the volume of the receiver as well.

A unique feature of this amplifier is the self-contained B and filament power supply for supplying current to a small short wave

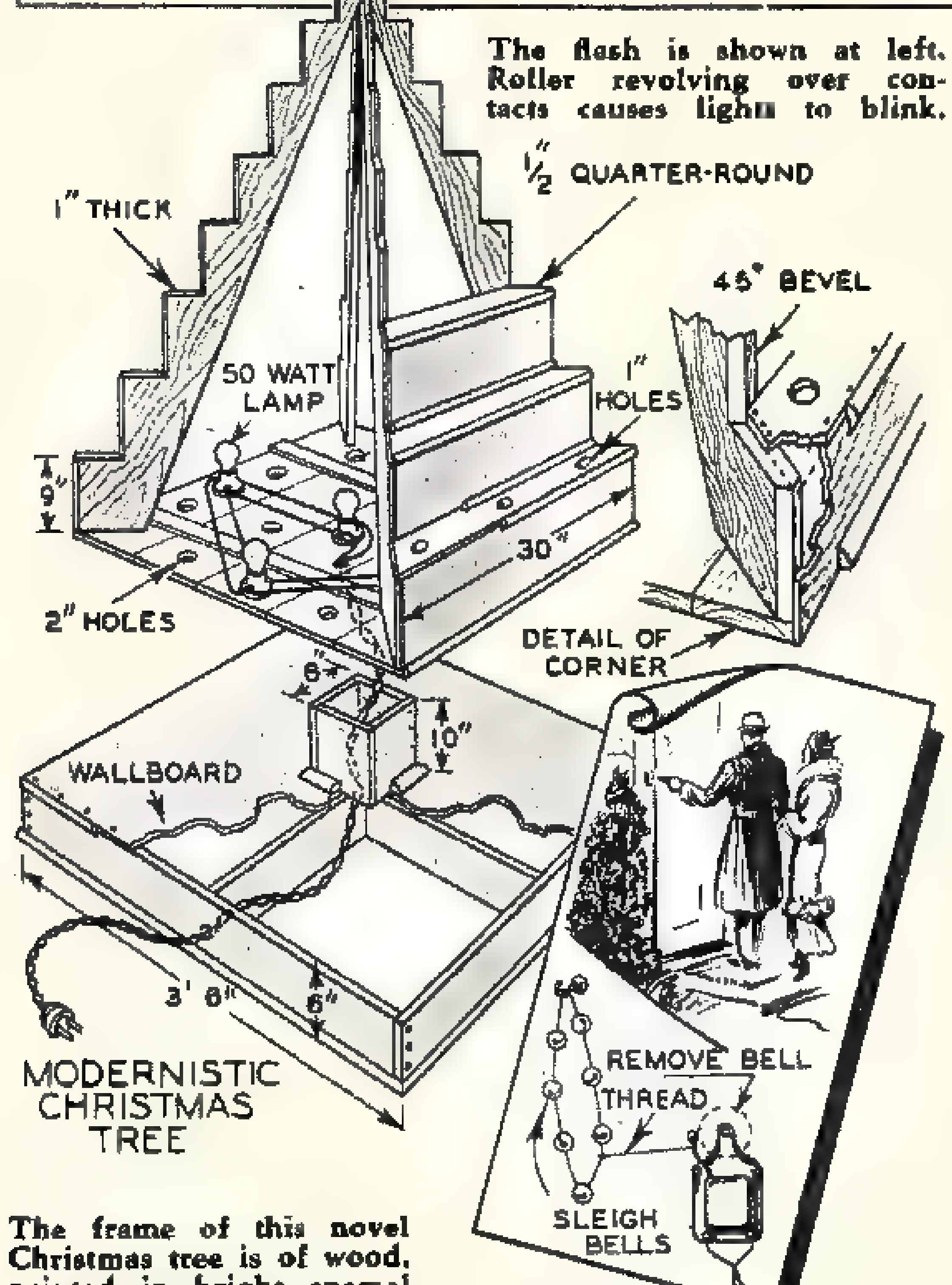
[*Continued on page* 132]

EXTEND HOLIDAY GREETINGS WITH OUTDOOR DECORATIONS

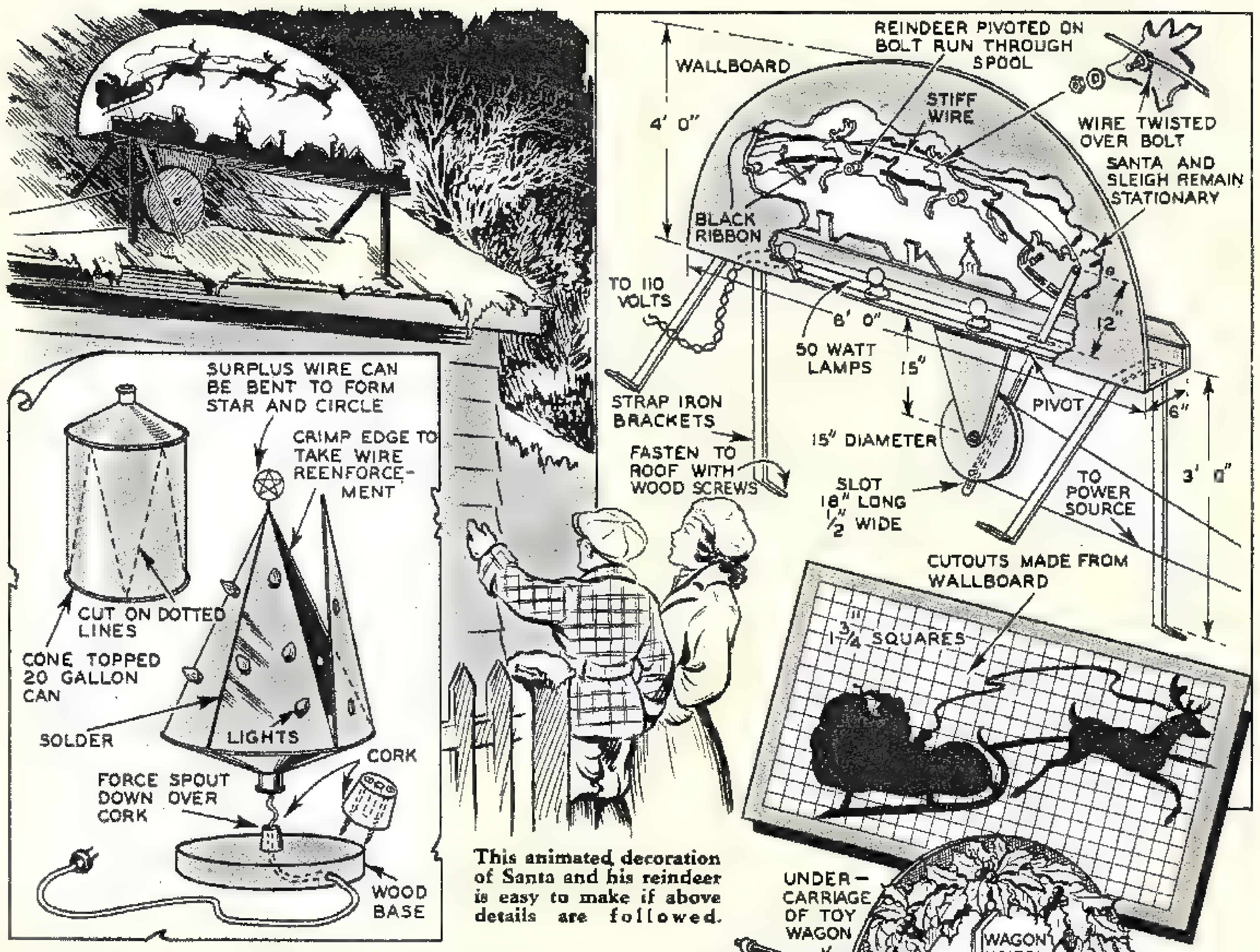

HEAVY WALL-BOARD 1/4" THICK TURNS ON ALL LIGHTS
PANEL
1/2 x 1" CLEATS
FLASHER DRUM
TABS 1/4 THICK
30"
24"
MERRY CHRISTMAS
OPENING IS COVERED WITH THEATRICAL SCRIM AND BACKED WITH CARDBOARD. LETTERS ARE CUT IN CARDBOARD
PLASTER OF PARIS MOLDED OVER NAILS
100 WATT LAMP
BAKELITE
TABS 1/4 THICK
6"
8"
BRASS SPRING
12
CONTACT POINT
4
TABS ON DRUM LIGHT EACH LAMP SEPARATELY
CLEATS TURN ON ALL LIGHTS AT ONCE
FLASHER UNIT

This sparkling greeting archway blinks like a theater sign. The roller contact switch shown here operates lights. Plaster and water glass are used for snow.

The flash is shown at left. Roller revolving over contacts causes lights to blink.

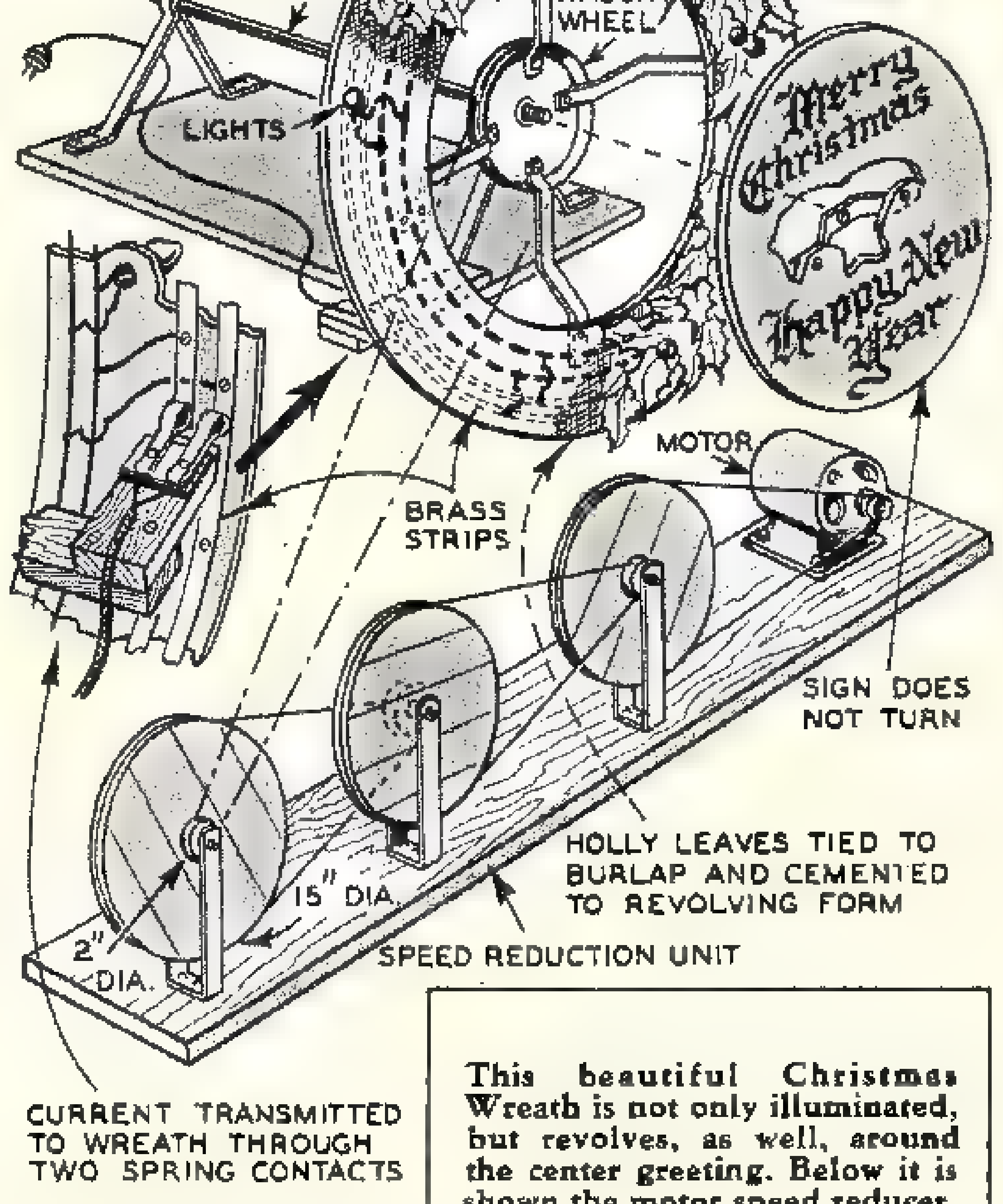

1" THICK
1/2 QUARTER-ROUND
45° BEVEL
50 WATT LAMP
1" HOLES
9"
30"
2" HOLES
DETAIL OF CORNER
6"
10"
WALLBOARD
3' 6"
6"
MODERNISTIC CHRISTMAS TREE
REMOVE BELL
THREAD
SLEIGH BELLS

The frame of this novel Christmas tree is of wood, painted in bright enamel with Cellophane covering.


SURPLUS WIRE CAN BE BENT TO FORM STAR AND CIRCLE
CRIMP EDGE TO TAKE WIRE REENFORCEMENT
CUT ON DOTTED LINES
CONE TOPPED 20 GALLON CAN
SOLDER
LIGHTS
CORK
FORCE SPOUT DOWN OVER CORK
WOOD BASE
REINDEER PIVOTED ON BOLT RUN THROUGH SPOOL
WALLBOARD
4' 0"
STIFF WIRE
WIRE TWISTED OVER BOLT
SANTA AND SLEIGH REMAIN STATIONARY
BLACK RIBBON
TO 110 VOLTS
8' 0"
50 WATT LAMPS
15"
12
STRAP IRON BRACKETS
FASTEN TO ROOF WITH WOOD SCREWS
15" DIAMETER
PIVOT
6"
SLOT 18" LONG 1/2" WIDE
TO POWER SOURCE
3' 0"
CUTOUTS MADE FROM WALLBOARD
1 3/4 SQUARES

This animated decoration of Santa and his reindeer is easy to make if above details are followed.

A 20-gallon oil drum provided this novel Christmas tree. Cut the can as shown, insert several sets of tree lights and then solder together and mount the tree on a suitable wooden base.


UNDER-CARRIAGE OF TOY WAGON
WAGON WHEEL
LIGHTS
Merry Christmas
Happy New Year
MOTOR
BRASS STRIPS
SIGN DOES NOT TURN
HOLLY LEAVES TIED TO BURLAP AND CEMENTED TO REVOLVING FORM
15" DIA
2" DIA
SPEED REDUCTION UNIT
CURRENT TRANSMITTED TO WREATH THROUGH TWO SPRING CONTACTS

This beautiful Christmas Wreath is not only illuminated, but revolves, as well, around the center greeting. Below it is shown the motor speed reducer.

by David A. Brown

IN THE creation of novel Christmas decorations for the home, amateur craftsmen will encounter many interesting tests of skill and ingenuity. Carpentry, electricity and metal working all play a part in the adapting of the traditional symbols of the season to modern ideas of design and utility, and the workshop enthusiast who directs his attentions toward such a seasonable project is certain to enjoy many hours of entertaining work; his home will reflect the spirit of the occasion; and he will have the satisfaction of knowing that he has done much to preserve the beautiful customs long associated with this ancient holiday.

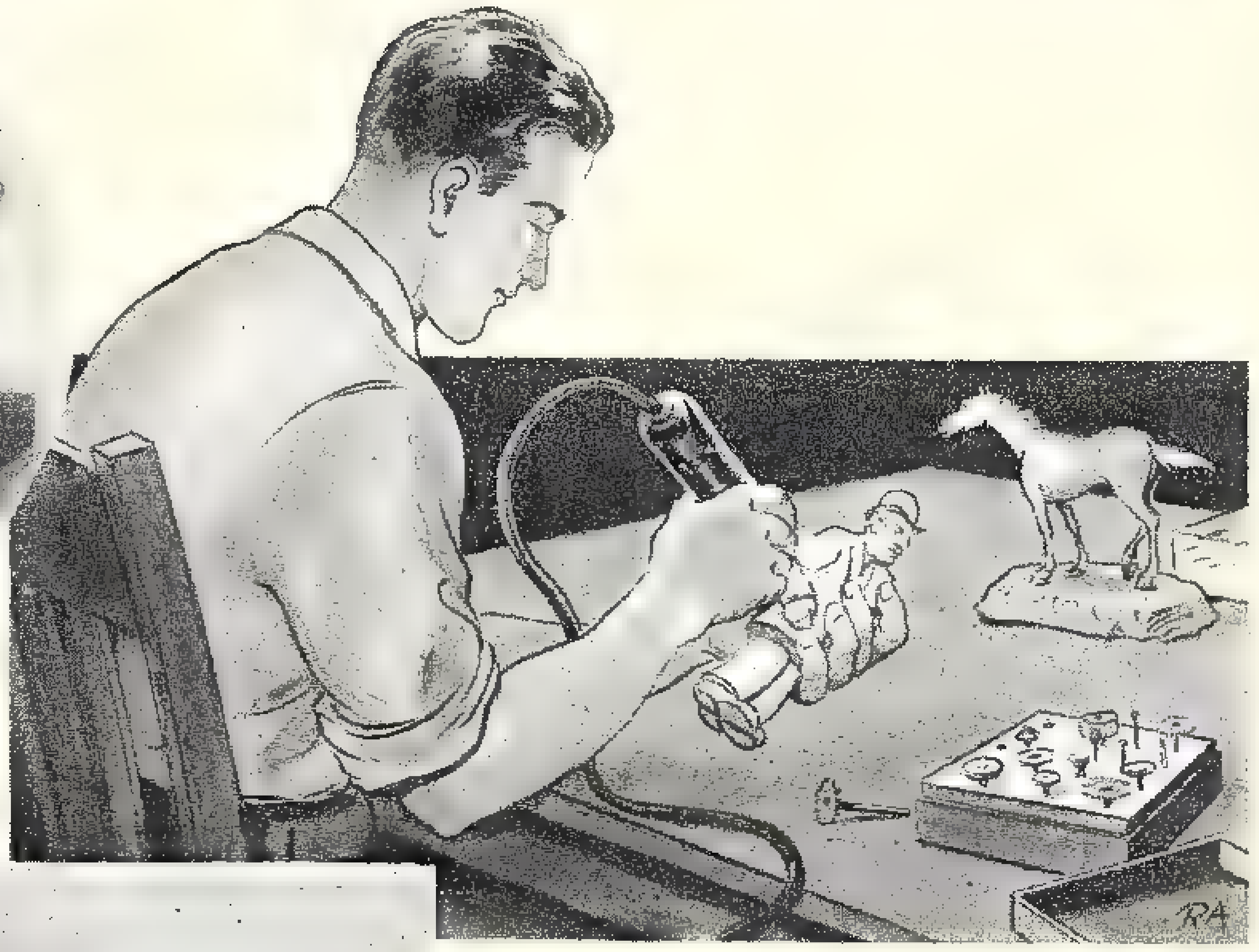
By combining light and shadow with motion, an unusual house top decoration may be contrived from the time honored Santa and reindeers. Cover the accompanying illustration with a sheet of tracing paper ruled into 1/8" squares and, with the intersecting lines as guides, transfer the figures to a 4'x6' piece of wall board which has been marked off into 1¾" squares. On similar material, lay out the semi-circular background. Cut out all pieces, and paint the silhouettes black and the background blue. Coat this last with shellac and sprinkle with mica sign painter's brilliants while still wet. Tack the house tops to the front edge and the background to the rear edge of a light trough constructed of 1"x6" material. Wire this trough to take four 50-watt blue colored light bulbs and cut the opening through which the slotted lever passes. Swing this lever on the shank of a long wood screw or heavy nail driven through it from the rear edge of the trough.

Screw two wooden candy pail lids together so that their beveled edges form a belt groove and mount it on a ¼"x3" bolt lock-nutted to the single wood support which projects down from the bottom of the light trough. A lock-nutted bolt set on the outer circumference

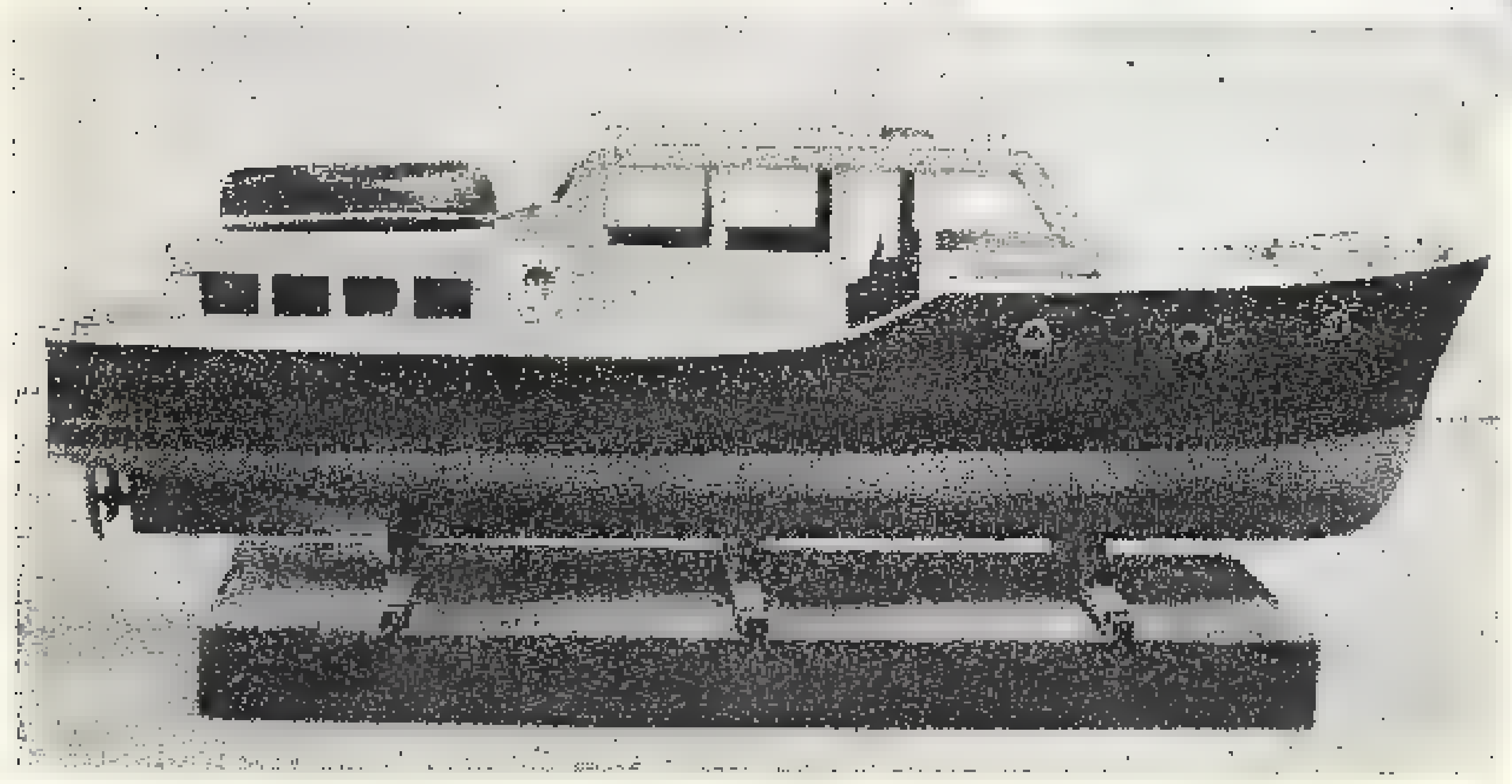
[*Continued on page 132*]

TINY HAND POWER GRINDERS SIMPLIFY MODEL CARVING

This model ship is just one of the many interesting projects that can be fashioned to exacting specifications by using a hand grinder for carving.



Interesting caricatures such as this one are easily carved from solid or laminated blocks of wood. The hand power grinder is provided with a chuck for taking numerous cutting, drilling and sanding tools.

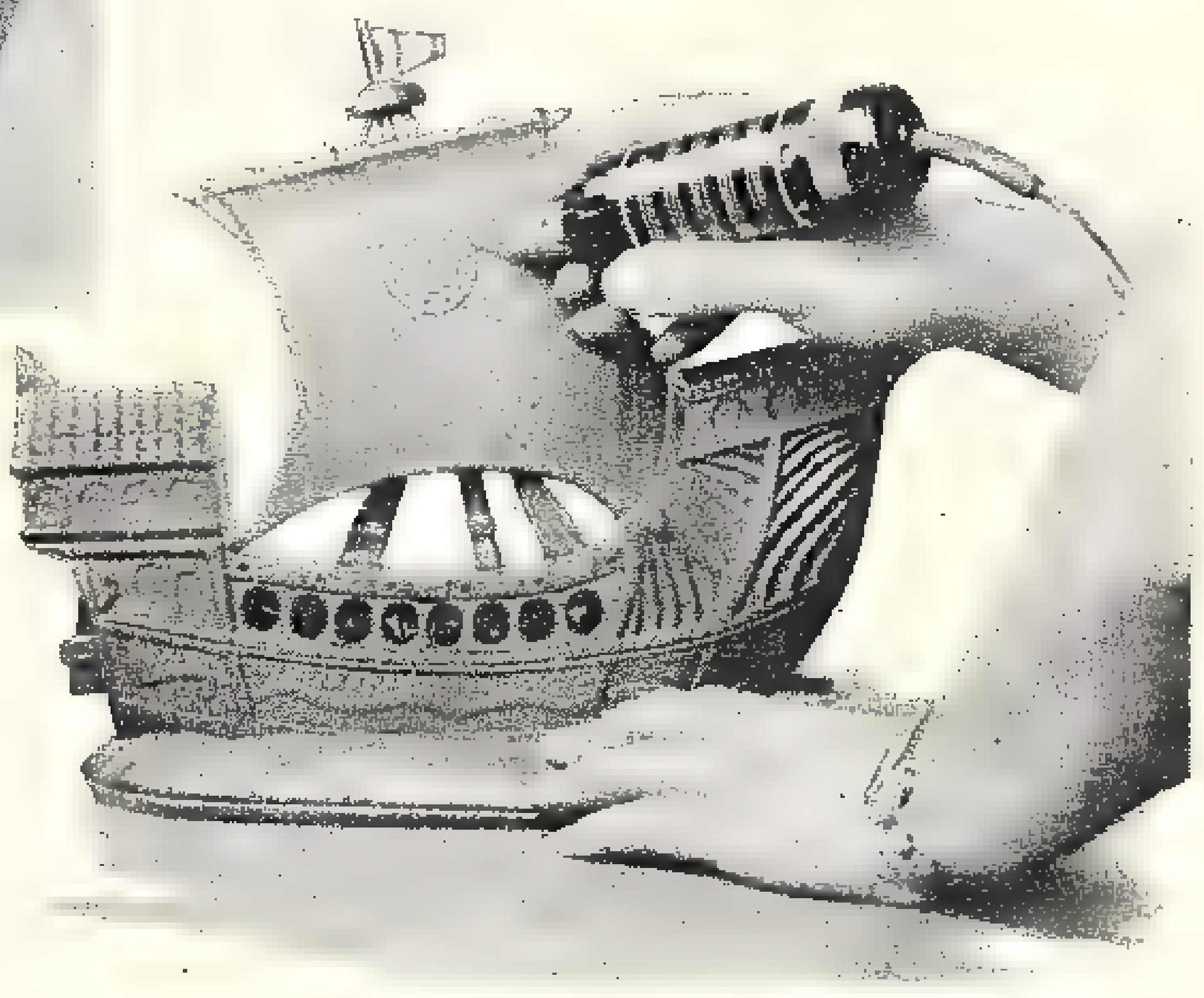


Though it has all the marking of the professional modelmaker the miniature craft shown above was made by an amateur model fan. Some details and sanding were done by grinder.

by A. T. Dalton

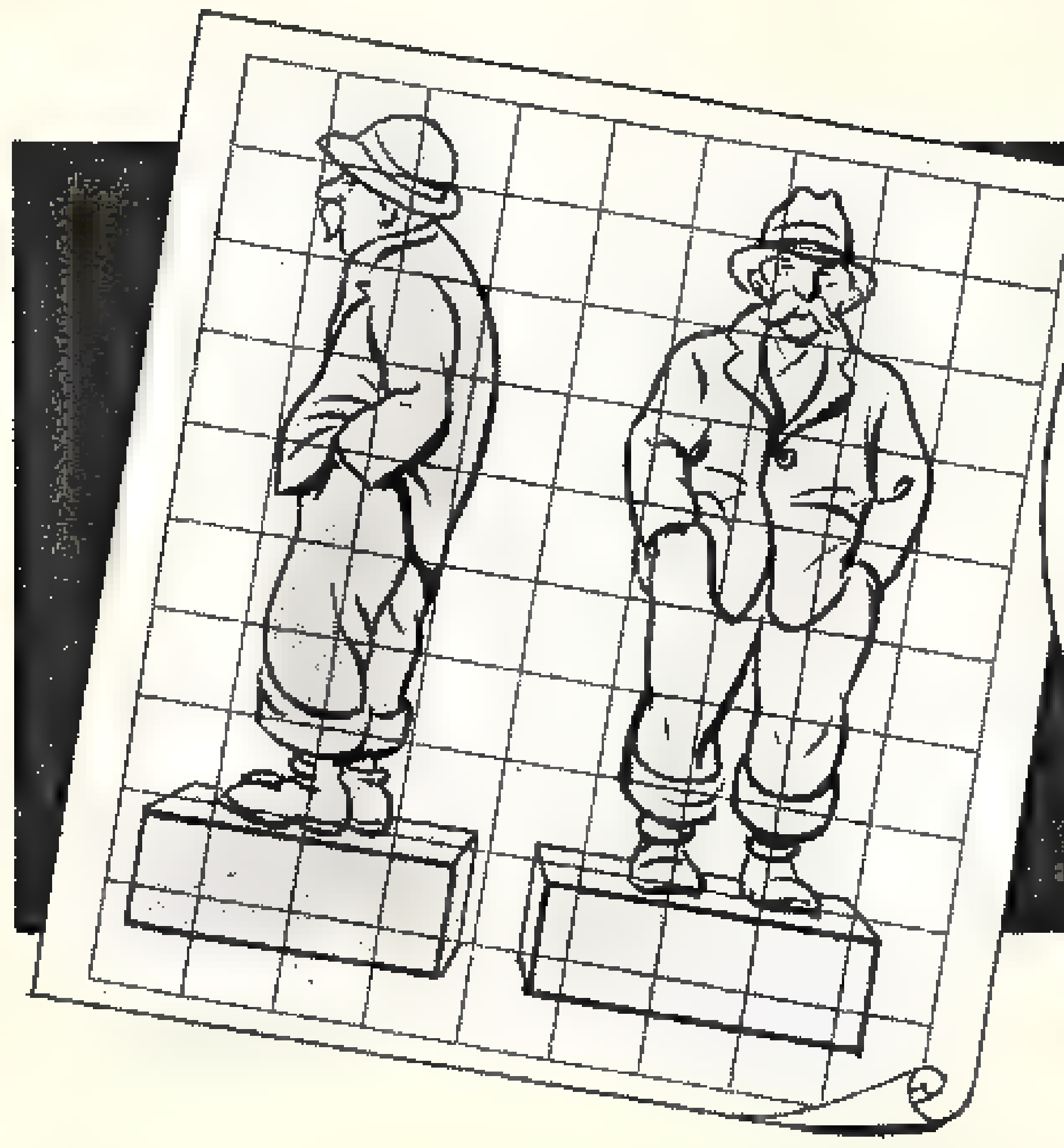
TO THE man who has a small workshop and limited room at his disposal yet who has a reasonable knowledge of wood-working and desire for carving there should be a very definite appeal in the new light weight portable high speed electric tools which allow a limitless variation of carving on wood, stone, cast resins and other material of this character.

These high speed, light weight, electrically driven tools are conveniently shaped to fit the hand and owing to their perfect balance can be used over long periods of time without danger of fatigue. The secret of their great usefulness for carving lies in their high speed. A large variety of especially developed steel cutters are used with the unit and leave smooth uniform cut and does not have to be finished by sanding or other means. This class of tool is, primarily, a finishing tool and thus lends itself to finishing work that has been roughed out.



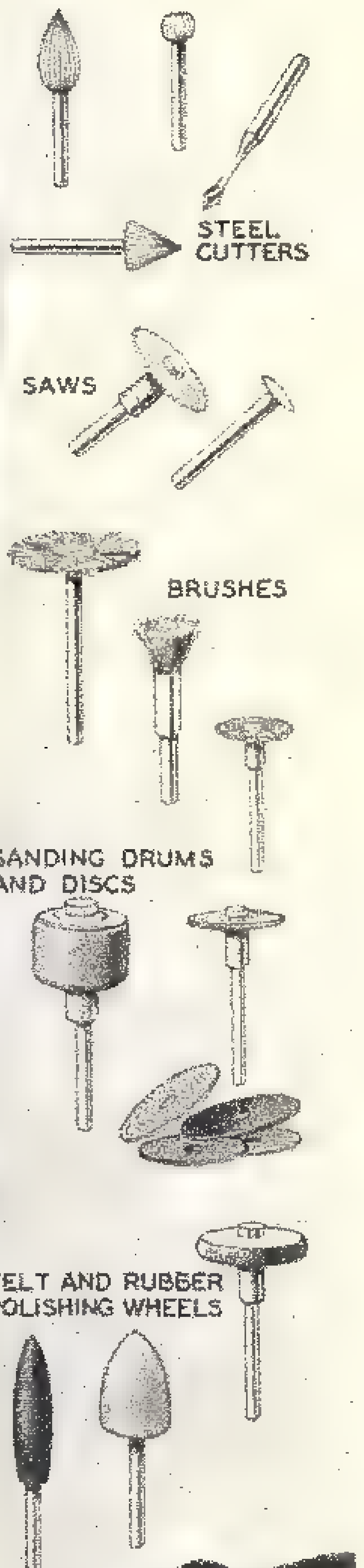
This attractive ship lamp nearing the final stages of completion was carved from a block of walnut. The tiny decorative designs are being applied to the sail with a finishing bur tool.

Another method most frequently used is to cut plywood to the appropriate figure desired and glue the plywood together to form a laminated block. For the craftsman who has not had previous experience in woodcarving it is suggested that the rough figure to be carved be cut from a solid block of wood by means of a hand saw.

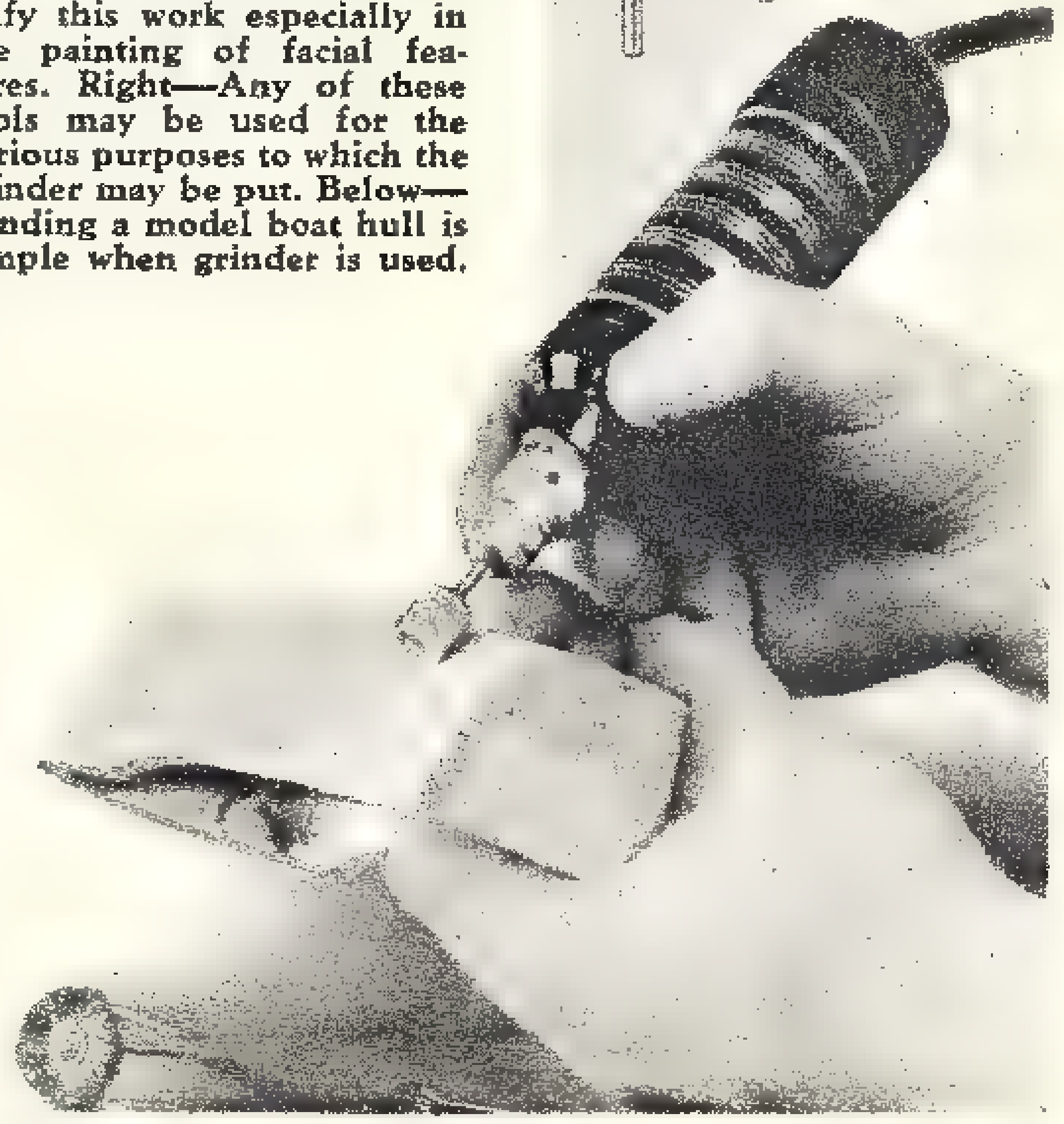


Carving wood caricatures is not difficult provided the figure is sketched in front and profile views on the block of wood. Comic strip characters also are excellent subjects for carving and are easily made.

A plaque like the one shown here of Will Rogers can be carved by first tracing picture on a flat wood block.



Carved caricatures can be finished in a very attractive manner by painting them with colored india inks, water colors or lacquers. A few camel's hair brushes will simplify this work especially in the painting of facial features. Right—Any of these tools may be used for the various purposes to which the grinder may be put. Below—Sanding a model boat hull is simple when grinder is used.



The figure shown in the accompanying illustrations makes an interesting project relatively simple for the amateur craftsman who wishes to try his skill with these new type of hand tools. There are no excessive details such as hands or background with this figure. The squared diagram shows the front and side views. Transfer these profiles to their respective positions on the wood-block which has been built up from plywood or, if you prefer, solid block of wood. The design can then be cut out with band saw, jig saw or with a hand saw.

Using a rather large steel cutter rough out the design to the approximate figure following the outline given. Many craftsmen indicate the form that the model is to take by shading the design that has been drawn and transferred to the block. This often times serves as an excellent guide for bringing out different characteristics of the carving after it is actually underway.

It is difficult, and perhaps futile, to explain the step by step procedure to follow the modeling of the face for an example. With a design as simple as our first figure it is apparent that the cheeks, jaws and any portion of the fact are first cut with a relatively large steel cutter. Mustache, eyes, eye-brows and nose are formed with smaller steel cutters of the ball shape and flame shape, a large variety

[*Continued on page* 124]

COMPLETING the MODEL *Mayflower*

Authentic in every detail this miniature of the famous Mayflower can be built by anyone handy with tools. This final installment covers painting and rigging.

by Erling W. Eklof

PART III

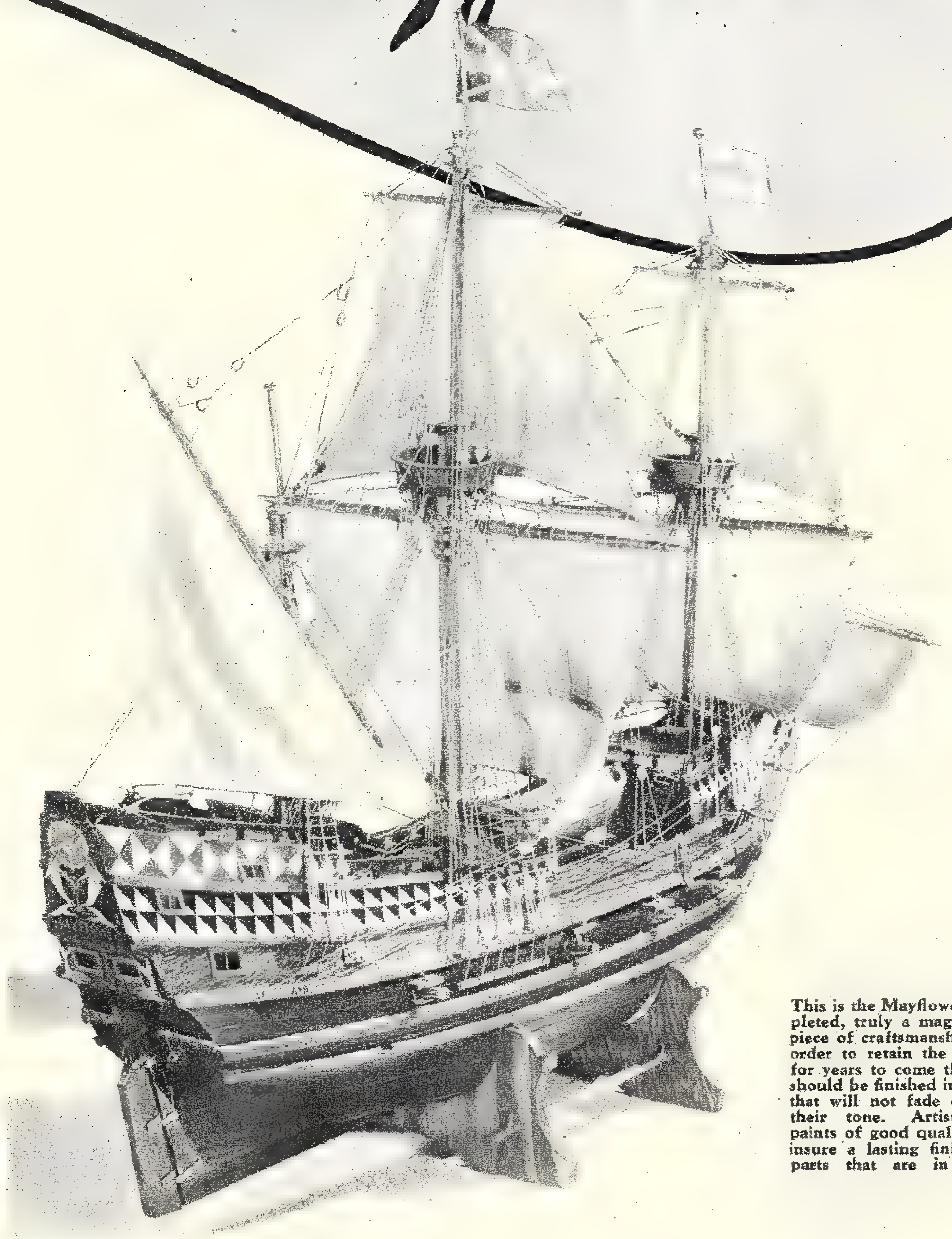
HAVING completed all hull and cabin details on the model *Mayflower* as described in the November and December, 1936, issues of MODERN MECHANIX HOBBIES AND INVENTIONS final work on the painting and sail rigging of the ship may be started. In these, the final stages of your model extreme care should be exercised in painting and assembling the sails and their rigging so as to follow out the authentic details as much as possible.

For painting the model, you will need at least one small sharply pointed brush to get into the small places and one flat ½-inch chisel shaped brush. You will also need one can of light oak stain and one can dark mahogany. To get the desired shades mix these two stains in varying proportions. Blue, white and black enamel and varnish will be needed as will tubes of oil paint in yellow ochre, Indian red, raw sienna and dark green.

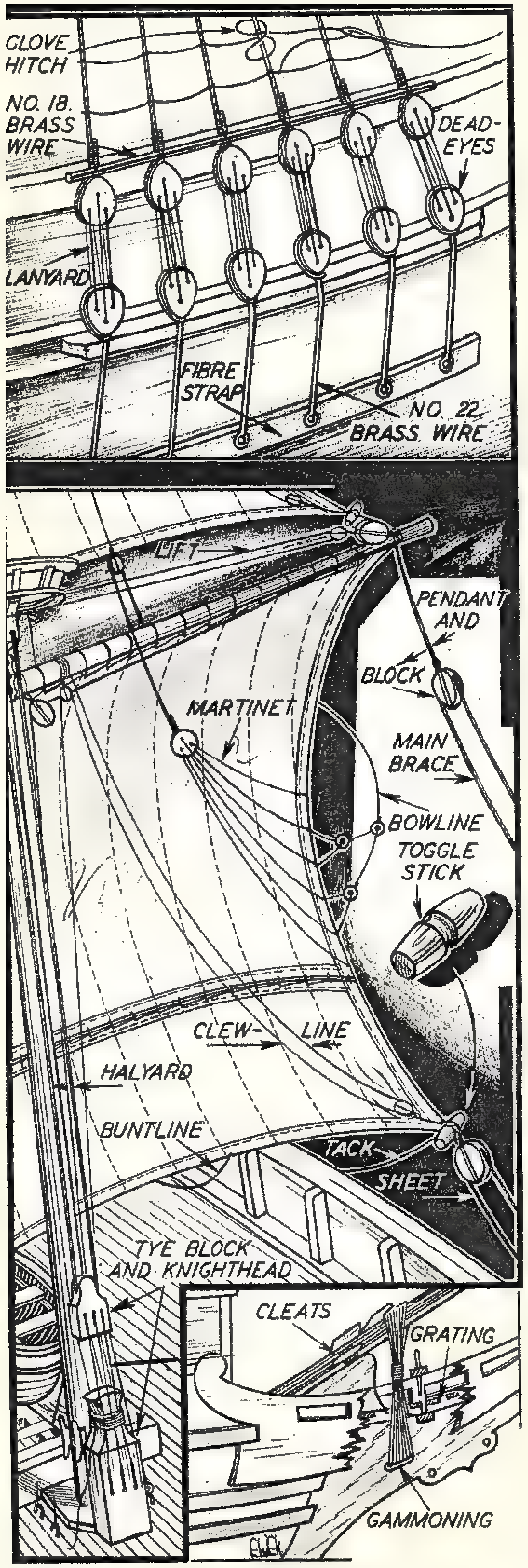
Now you can start the decks. You want a light natural woody color. Get this by using just a touch of dark mahogany in light oak stain. Don't let it get too dark. You want some contrast between the decks and deck fittings which will run to a little darker than medium brown. Make the inside of the bulwarks a little darker than the decks, and the timberheads a shade darker with railings and steps quite dark. You will find by rubbing a little Indian red on the steps, ladders and rails that they will get a slightly worn appearance as if human feet and elbows had rubbed off some of the finish.

The outside of the bulwark and wales is a rich brown chestnut color. The channel between the lower wales is black with Indian red brushed in and under the beak and trail boards some musty dark green. Below the wales, stain the hull dark brown. Rub some yellow ochre along under the water line where the hull has its greatest beam. Rub or brush in dark green under the counter and under her belly coming up in close to the stem. Blend in these colors as if worn in by the ravages of time. On the trail boards and rails at the beak the conventional design of the time in black and white and blue and white should be carefully painted on. The same applies to the stern castle sides. I chose blue because it is a symbol of water and the sea; also designating faith and hope which is particularly appropriate to the pilgrim ship. Over the design, rub in a few light rusty stains; just enough to make it appear old. Paint a fine thin red line on the upper edge. Make the masts and yards a medium reddish brown, the panels in the doors black. The indentations on the fluted capstan and the top of the capstan are black. The cleats are light and worn. Paint the long boat the same as the hull of the ship. The thwarts and sail locker are a natural wood color. Stain the oars and mast. The wales of the long boat should be light.

In regard to the design on the stern of the *Mayflower*, you need not adhere to my origination providing you have an appropriate design of your own. May I describe the symbolic significance of the design. The flower at the top of the design is a semi-heraldic rose, the rose being, as you perhaps know,



This is the Mayflower completed, truly a magnificent piece of craftsmanship. In order to retain the beauty for years to come the ship should be finished in stains that will not fade or lose their tone. Artists' oil paints of good quality will insure a lasting finish for parts that are in color.



The topmost illustrations show the Lanyard threading and dead-eye mounting arrangements. Sail rigging is simplified by lower diagrams showing how linen threads fasten to tackle.

same way. Drill one hole in place of three. By flattening the sides of the dowel, blocks may be made in the same fashion. Drill one hole near one end of the block. In the event that you have no lathe to use, you can reverse the process, drilling the holes in the end of the dowel, then grooving and cutting off with a hand scroll saw. Very fine blocks and deadeyes can also be purchased from ship model supply houses. It is essential that deadeyes and blocks should not be used too large or the appearance of the whole model will be spoiled.

Concerning the sizes of cord for rigging, the heavy rigging used for shrouds will be No. 5 mercerized crocheting cotton. For the medium, No. 10; for the light, No. 40, and for the fine used for lanyards and ratlines, No. 60 serves very well. This may be obtained at any dry goods store. Dye the heavy, medium brown, and the medium cord, just a tint lighter. The light and fine cord numbers 40 and 60 respectively should be dyed a tan color, a shade darker than ecru. To do this, draw the cord through dye or stain of the desired shade. If you wish, you may use linen fish line which, outside of being stronger, has no particular advantage.

After having stepped the masts glue in the bowsprit and lash it down with the gammoning. Use the heavy cord for this. Throw a hitch around the bowsprit and slide it down to the cleat. The cord goes through the forward end of the slit in the cutwater from the port side to the starboard. Then up around the bowsprit from starboard to port for about eight turns. Wind the cord around each half of this lashing and secure it with a clove hitch so you will be able to wind about five turns around the whole of the lashing. Fasten the end with a good knot and the gammoning is completed.

Next come the chain plates. They are the straps that go around the deadeyes and secure them in their position just above the chain wales. They are made of No. 22 brass or aluminum wire. Bend the wire around the deadeye and make a twist to secure it and then below where it fastens to the hull, make a small eye in the wire to take a pin. Where the chain plates are secured to the hull, there is an iron strap (make this with red fibre) that follows the sheer line. Be careful to keep the deadeyes even.

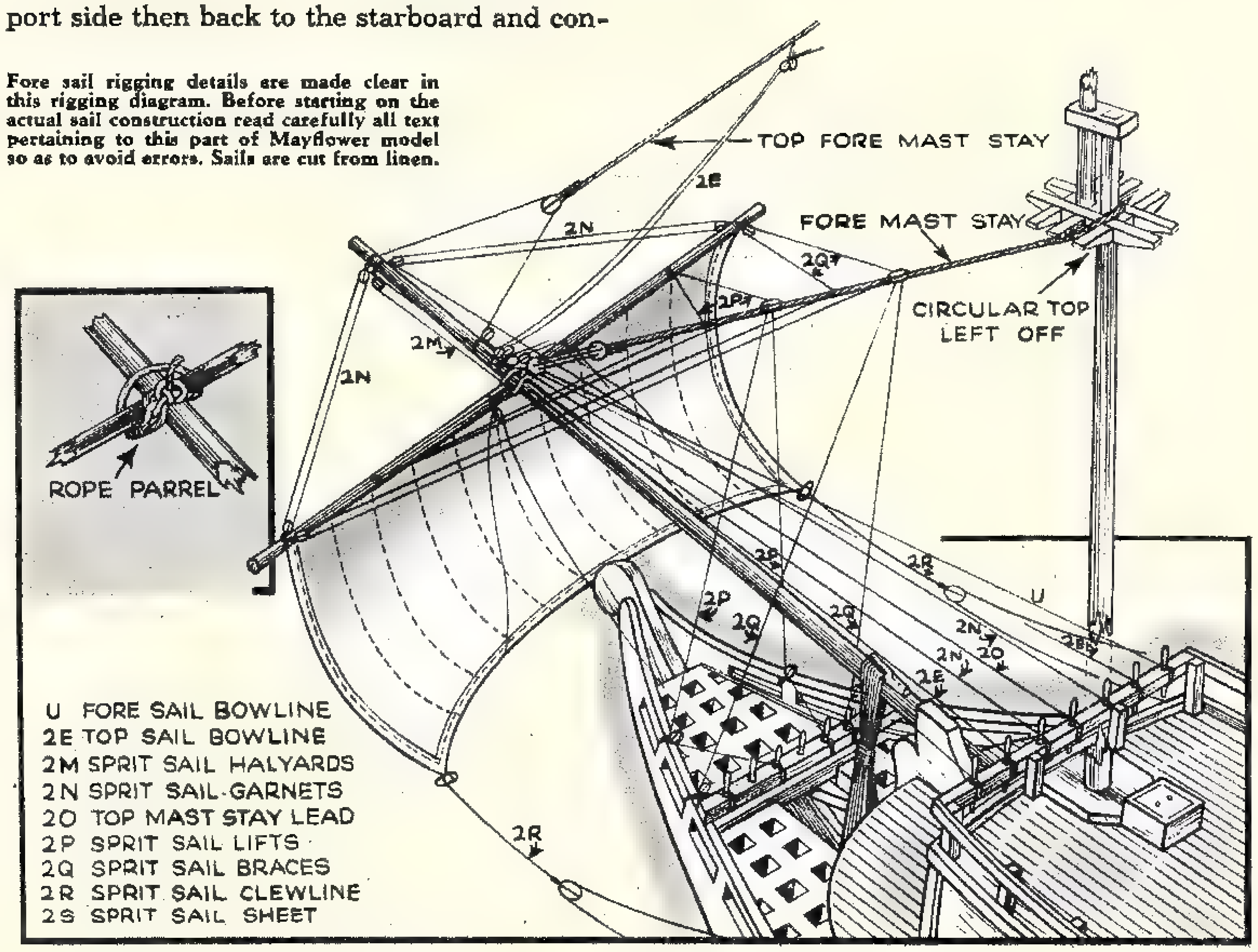
After you have all the chain plates and their deadeyes in place, take a piece of heavy cord and seize it around a ¼-in. deadeye. To aid in setting up the shrouds, make a U shaped sharp cornered form from No. 22 wire to hold the deadeyes about two of their lengths apart. Insert this wire form in the hole of a left hand deadeye on the chain wale and put the other end through the deadeye seized to the heavy cord. Now pass the cord up through the lubbers hole, around the mast and down through the lubbers hole on the same side, and seize a deadeye to its lower end, even with the first. Draw a lanyard of fine cord through these two deadeyes in this manner. First tie a knot in one end of an 8-in. cord. Reeve this through the right hand lower hole of the upper deadeye looking from the outside with the knot in back, then down to the upper right hand hole in the lower deadeye, then up to the middle hole of the upper deadeye, down on the outside to the corresponding hole in the lower deadeye, up again to the remaining hole in the upper deadeye, and down to the left hand hole in the lower deadeye and fasten with a clove hitch where the shroud is seized to the upper deadeye. Do not cut off the loose end as yet. Now take the wire form off of the first set of deadeyes and run the lanyards through them. Draw the deadeyes even and secure with clove hitches. Cut off the loose ends. Seize the two shrouds together directly under the cross trees. Do the same on the port side then back to the starboard and continue until all the lower main shrouds are on. Keep the mast in the central position, but leaning aft a little more than one part in thirty. When the main stays are put on, they will pull it forward to its correct position.

The fore and mizzen shrouds are done in the same method, but because of the odd numbers of the shrouds, they go around the masts and to the opposite side instead of in pairs on the same side.

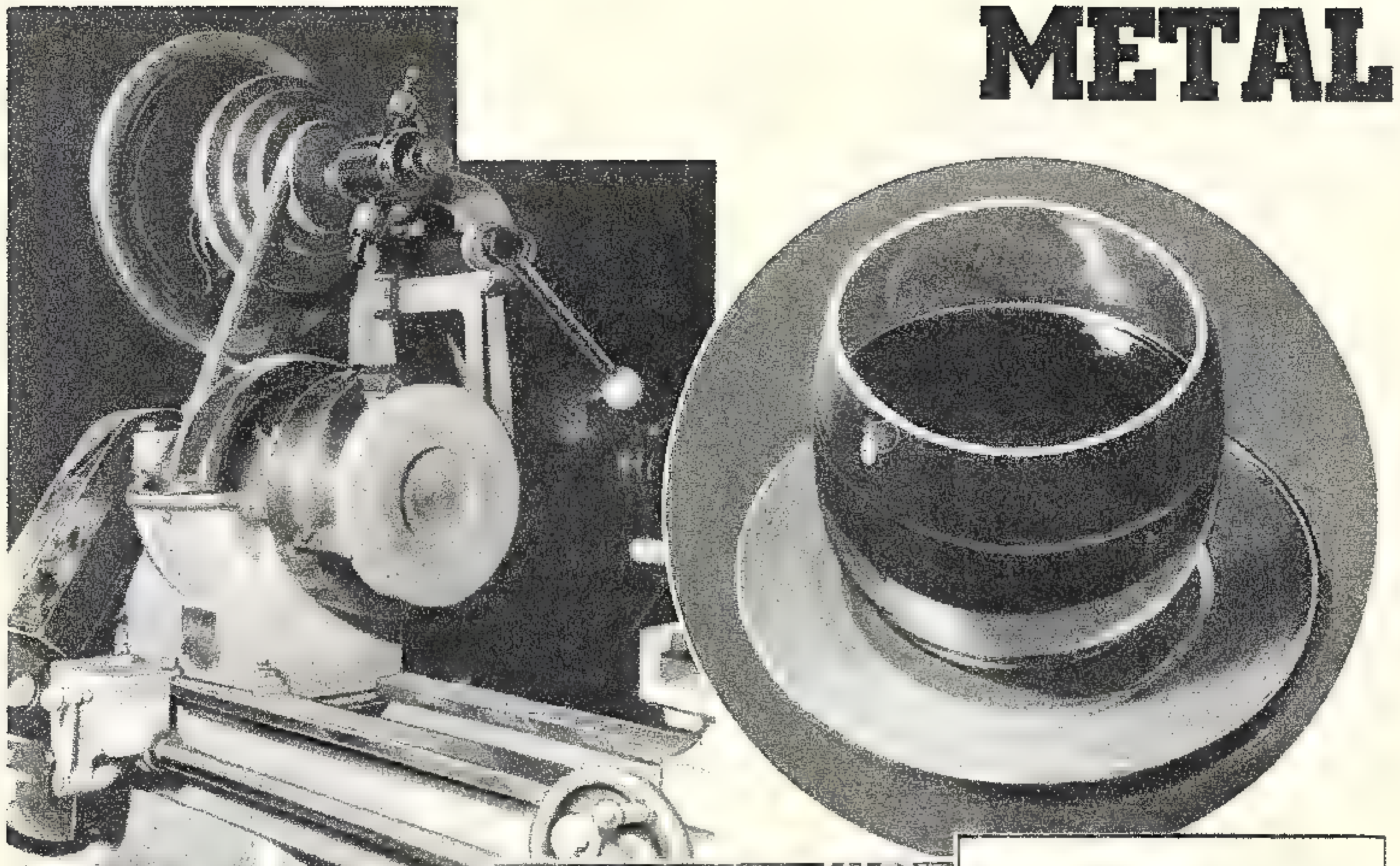
Let's get at the stays. Lay up three parts of heavy cord by fastening the three ends in something firm and twisting the other three ends with an ordinary hand drill. Two cords twisted similarly will serve as the mizzen stays. Saturate them with thin model aeroplane glue to keep them from unraveling. The main stay is double in the form of a strap. It goes up between the cross trees and around the mast; the other end goes through a hole in the stem. The whole stay is pulled together with a lanyard using the $\frac{3}{16}$-in. round deadeyes and passes on each side of the fore mast, the lanyard being situated immediately behind this mast. The fore stay is fastened by a lanyard, its lower deadeye lashed

[*Continued on page* 126]

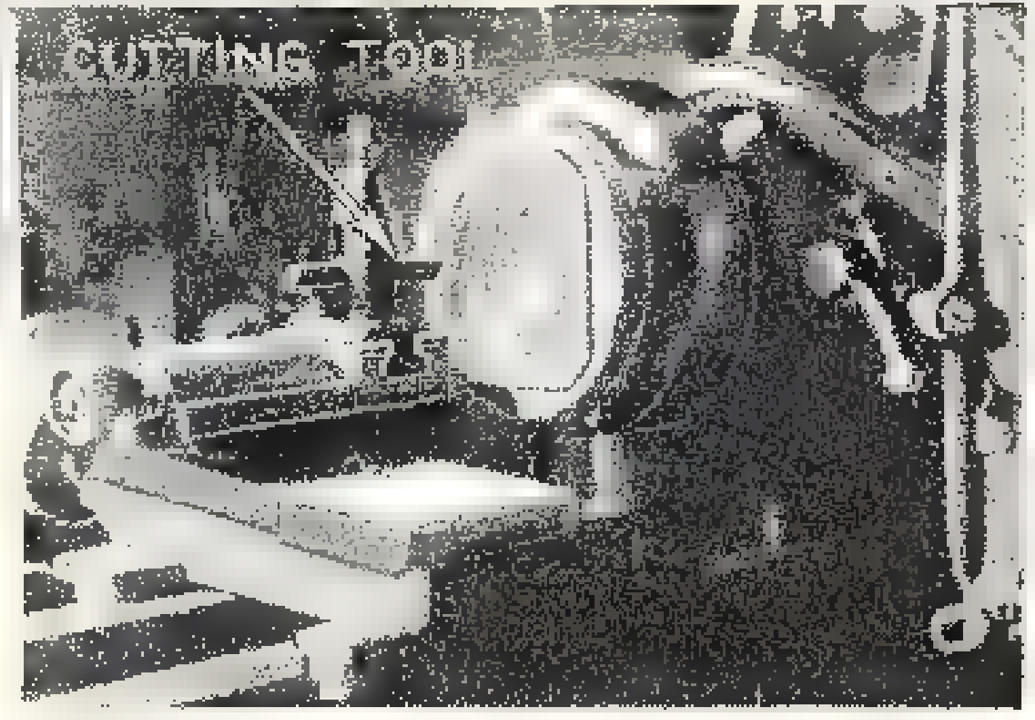
Fore sail rigging details are made clear in this rigging diagram. Before starting on the actual sail construction read carefully all text pertaining to this part of Mayflower model so as to avoid errors. Sails are cut from linen.



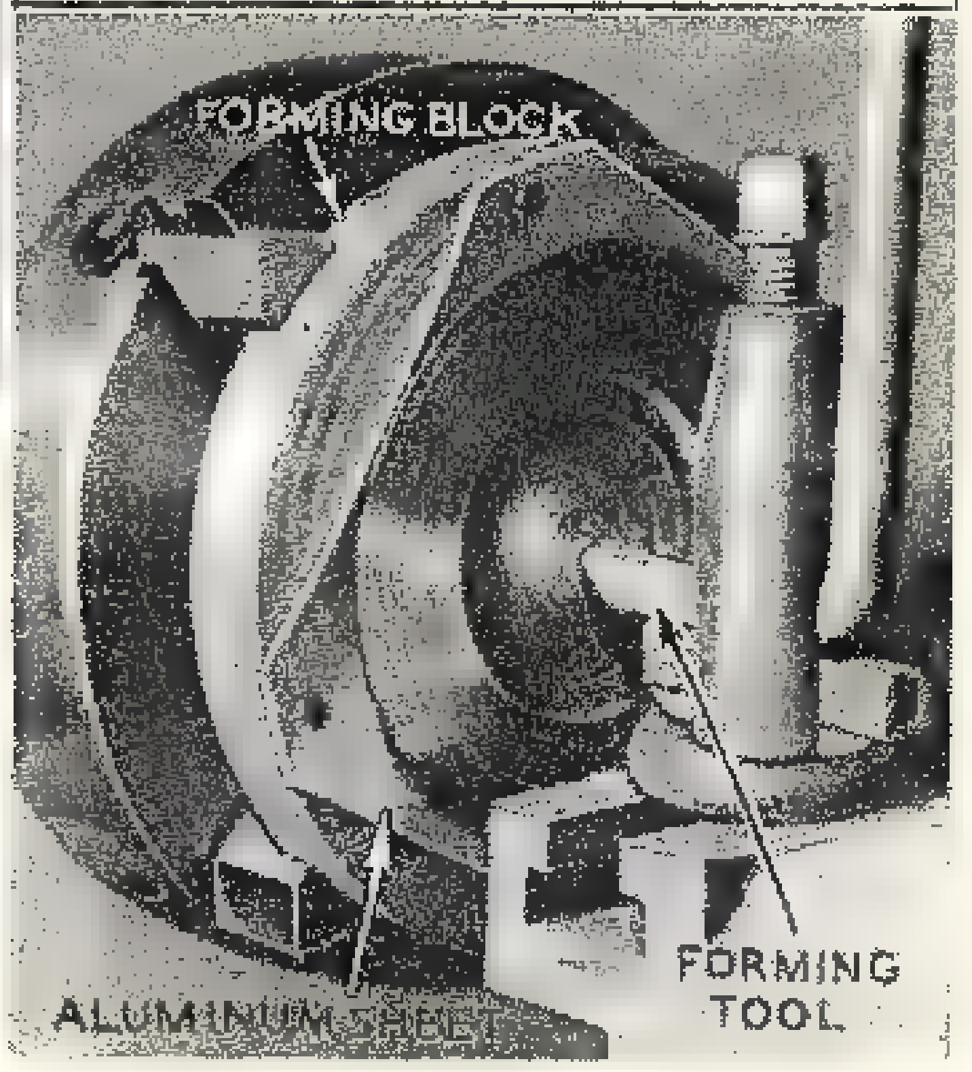
METAL PROJECTS ON A LATHE



The simple coaster pictured in the circle above is the ideal project for the beginner in metal spinning. Before any actual spinning is done a hardwood form or mold must first be made. Above is shown a completed mould in the lathe.



After the metal sheet has been turned to fit the wooden form the square corners are trimmed off with a regular lathe cutting tool.



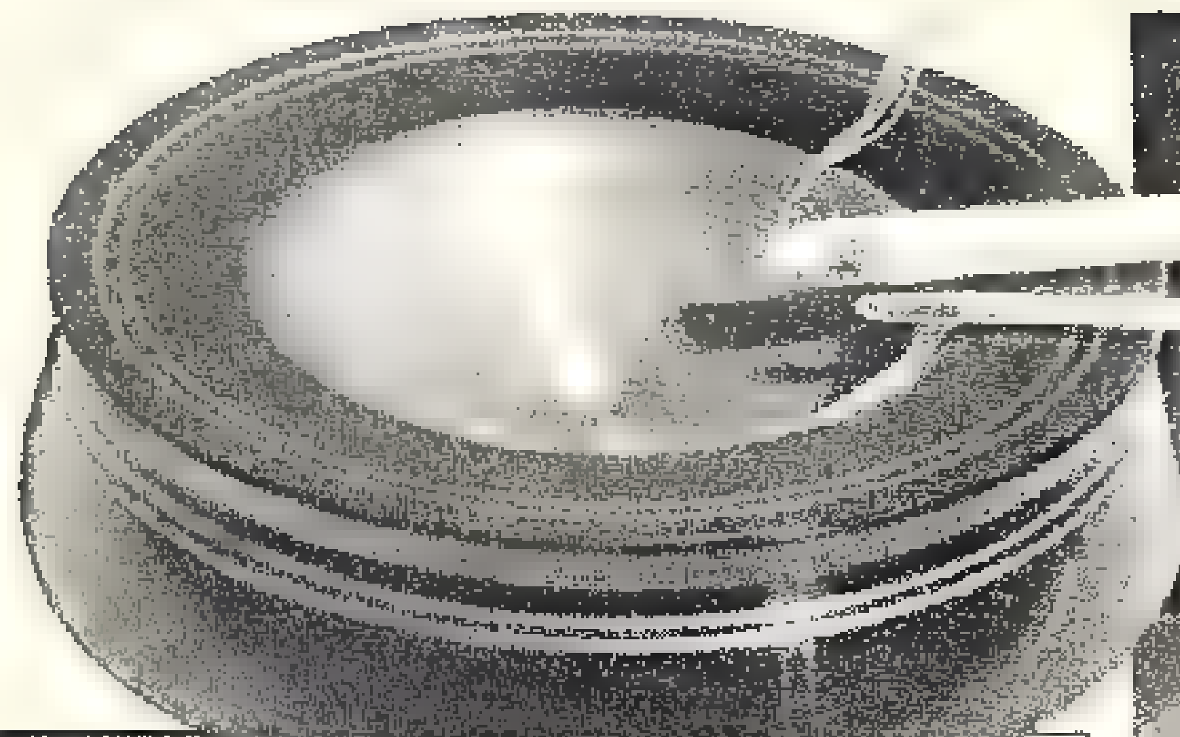
Right—In spinning this aluminum dish run the forming tool from the center of the work until the sheet metal follows the shape of the hardwood form.

by Dale R. Van Horn

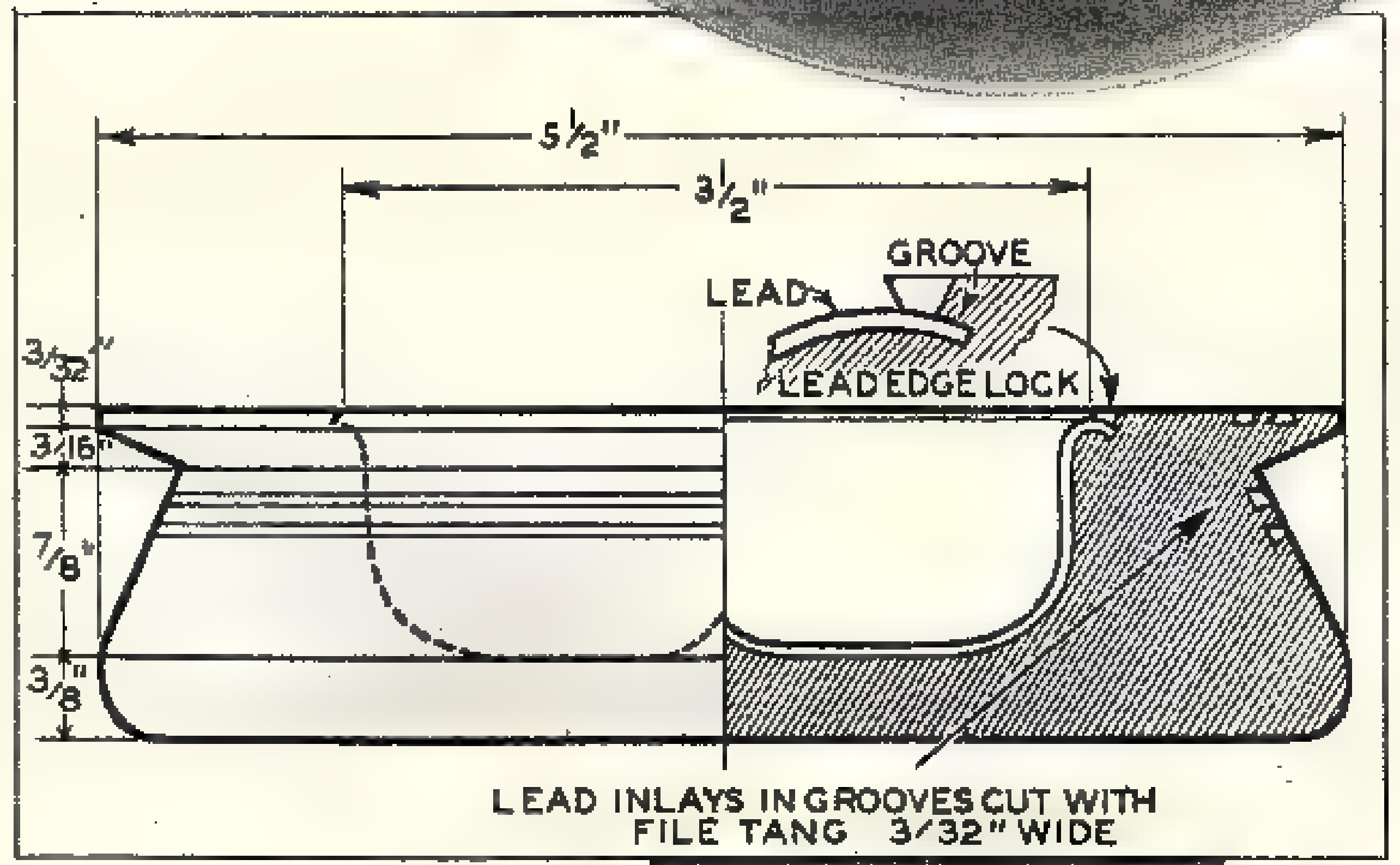
SOME soft metal lends itself so admirably to manipulation in a wood turning lathe, that projects involving its use are an interesting home shop diversion. With some patience one can turn out very presentable creamers, trays and boxes with lids from sheet brass, aluminum and copper.

Sheet lead is so ductile, easily worked and bears such a close resemblance to pewter when finished, that this metal is ideal for the beginner in spinning metals. This article covers briefly a number of simple projects, each one easily made. It also touches the use of a metal lathe for harder metals.

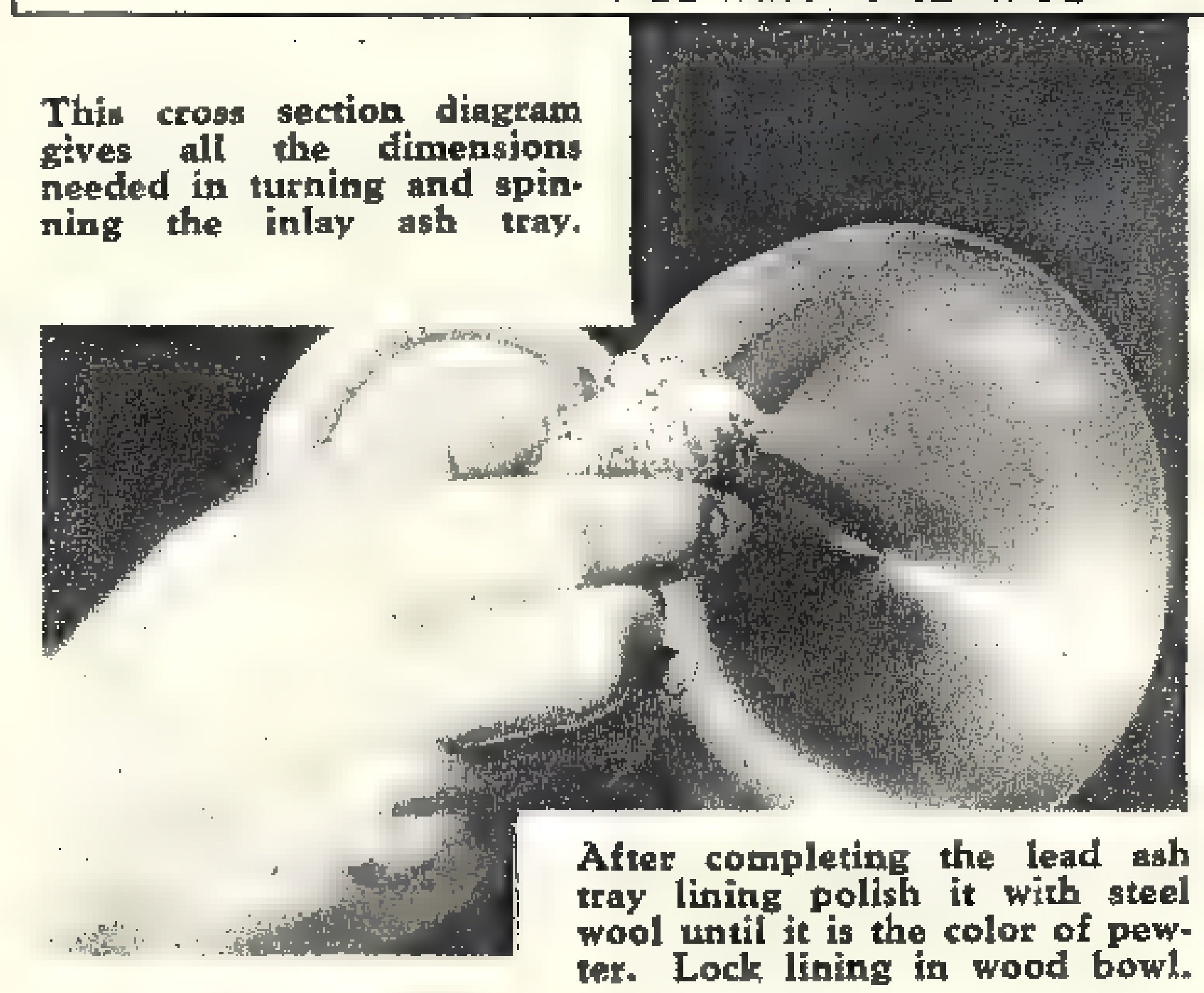
One of the easiest ways to spin soft metal dishes is as follows: Briefly, you need two pieces of wood and a sheet of metal. Turn one hardwood block to the shape you desire for the inside of the dish: Turn another small block from 1½ to 2 inches in diameter and about ½ inch thick with one side smooth, the other carrying the deep indentation of the dead center. The sheet of lead is centered between these two blocks, rubbed with candle and the metal gradually forced over the form. Should there be any tendency for the metal to work out of line, make a depression in the right end of the mold not more than the sheet metal thickness in depth and see that the tail stock wood block is a little smaller. Then turn the tail stock up tight. This forms a bulge in the metal sheet which locks it in position so long as the tail stock is turned up snug. After forming, the metal is polished, the waste trimmed off and the piece then dipped in lacquer. Sheet pewter, aluminum, copper and brass can be turned into small, attractive dishes in the same manner.



This beautiful inlay turning can be duplicated in your shop after doing some experimenting with the more simple projects. The bowl is turned from walnut and the inlays filled with strips of lead. The bowl lining is spun from $\frac{1}{16}$" sheet lead.



This cross section diagram gives all the dimensions needed in turning and spinning the inlay ash tray.



After completing the lead ash tray lining polish it with steel wool until it is the color of pewter. Lock lining in wood bowl.

Access to a metal turning lathe simplifies greatly, the work involved in forming shallow dishes from soft and semi-hard sheet metal. A little coaster of sheet aluminum of considerable thickness was formed in a jiffy in the metal lathe setup. The hardwood block turned to shape, acts as a mold for the coaster. Any round tool can be set in the tool post, then the metal forced to the shape of the mold and later the waste cut off. After forming the piece should be rubbed with coarse steel wool. Rough aluminum or copper pin trays can be made without special rigging in the wood lathe by using a wood mold and letting the edges take whatever shape they wish.

Let's next try a simple, all-metal ash tray which can be made in groups of four for home use or bridge parties. From a wholesale plumbing or hardware concern, get sheet lead having a $\frac{1}{16}$-inch thickness. Turn a soft wood block down in the lathe to 4 inches in diameter. Bend the lead corners over the side of this and tack in place. Start up the lathe and with the round end of a dowel, rub the lead flat against the wood. To reduce friction and heat and to prevent possible cutting of the lead by the dowel, rub the metal surface with a candle stub for lubrication. At high speed, rub this now smooth surface with fine steel wool to give it a good luster. Then wipe with a rag dipped in soda water or vinegar to cut off the grease.

Cut another block of soft wood 3½ inches square and rather thick, then with the drill press, bore a ½-inch hole from each of the four sides to the center of the block. Center this block in the lathe and turn away enough of the right side to expose half of the holes, turn the block round and sand smooth. The lead square is laid over this with the polished side next to the wood and the corners again tacked fast.

Using the dowel again, and the candle stub, the unfinished side of the lead is smoothed and worked into the shape of the wood mold. When the depression has been made, remove the whole unit from the lathe and, laying a

AMATEUR PHOTO PUZZLERS

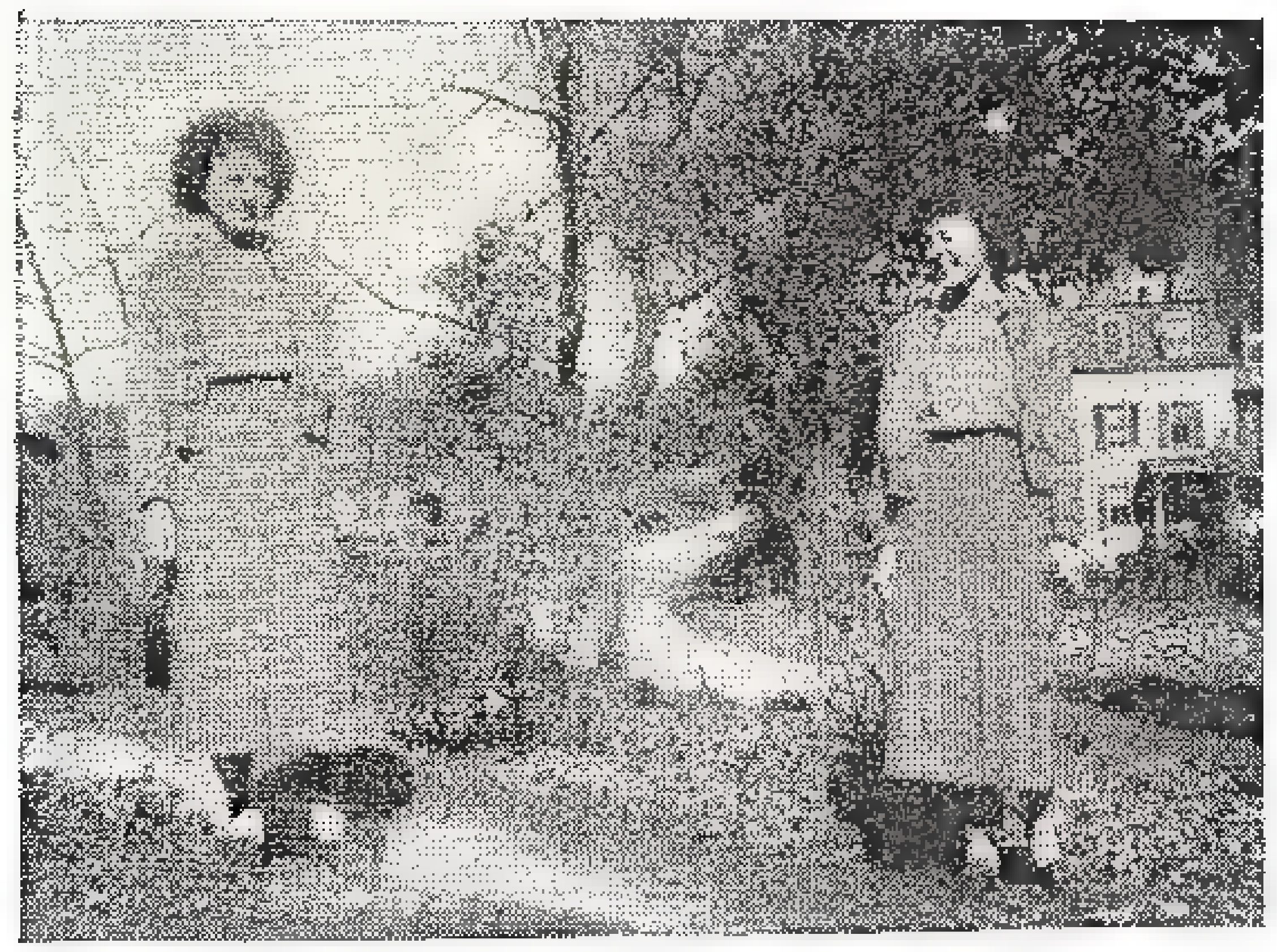
In this department the Photography Editor will answer any question or problem related to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope in case space does not permit publication of the question and reply on this page. Send all inquiries to the Photography Editor, Modern Mechanix Hobbies & Inventions Magazine, *22 West Putnam Avenue, Greenwich, Connecticut.*

MAKING A COPY OF SNAPSHOT PRINT

I have a small snapshot picture which I treasure very highly. I would like to secure an enlargement of this picture, but since I no longer have the negative I have been in doubt about the possibility of this. Since I know very little about photography I am wondering if you can enlighten me on this matter.—Grace Cook, Dover, Delaware.

Good enlargements up to 8 by 10 inches can be secured from small snapshot prints simply by photographing the snapshot on a fine grain film and enlarging this film to the particular size desired. Any photographer can do this work for you. The cost is nominal.

TRICK PHOTO RECEIVES $5 AWARD



By exposing one half of the film at a time with a "duplicator" Harvey Herdman, Branchville, N. J., secured this unusual picture. The girls are not twins, but one and the same person. For his clever photography Mr. Herdman receives $5.00.

ACTION PICTURES WITH BOX CAMERA

Is it possible to take action pictures with a box camera? Last month I attempted to take pictures of some of the exciting plays during our school's football season, but the results were very disappointing. What kind of camera should be used for taking action pictures?—David Rendown, Philadelphia, Penna.

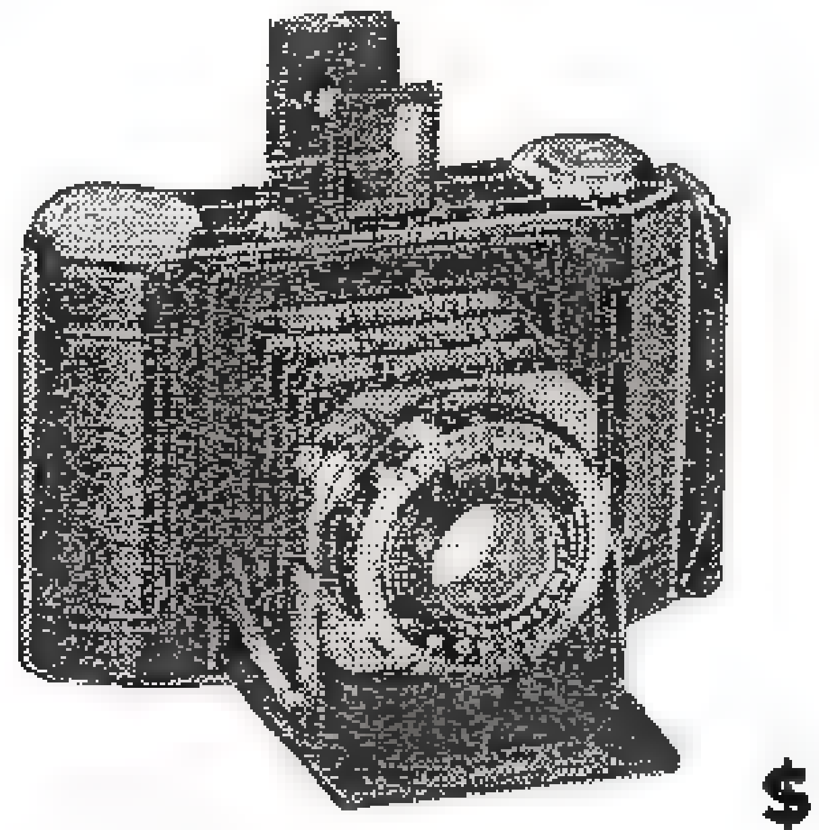
Action pictures cannot be taken with a box camera since it is fitted with a lens that is entirely too slow for the purpose. Action pictures, if they are to be clear, must be taken with a camera having a f.2 or faster lens. The usual box camera lens is an f.8 which is, as you can well see, too slow for recording action scenes.

The photograph editor will pay $5.00 or $3.00 each for photographs interesting enough for publication on this page. All pictures should be mailed to Modern Mechanix Publishing Co., Greenwich, Conn.

Kodak Christmas Guide

FOR THOSE WHO LIKE THEM SMALL

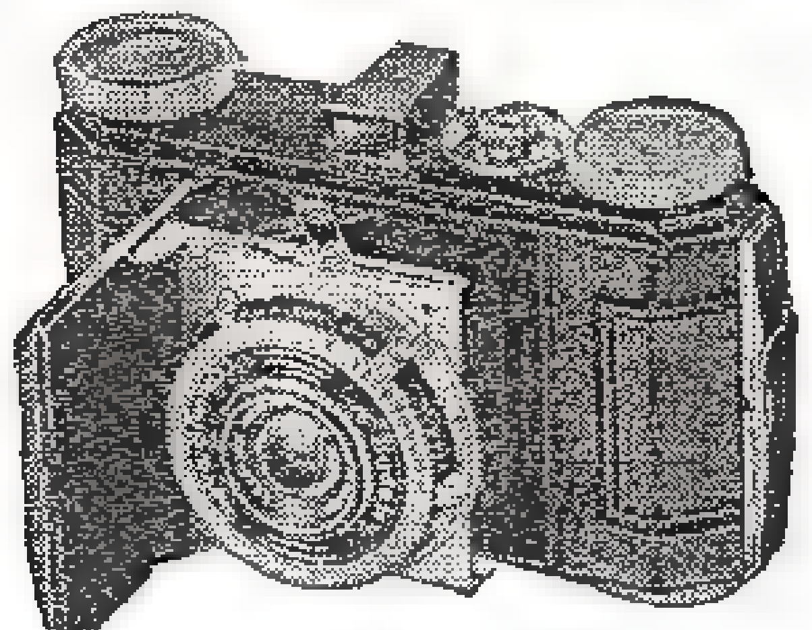
Miniature Kodaks



$5750

KODAK DUO SIX-20

A true "miniature"; compact, finely built, yet it takes 16 album-size pictures (1⅝ x 2¼ inches) on a roll of Kodak Film (four types available). Negatives are sharp; give big, clear enlargements. Shutter, 1/500 Compur-Rapid. Lens, Kodak Anastigmat *f*.3.5. Price, $57.50.

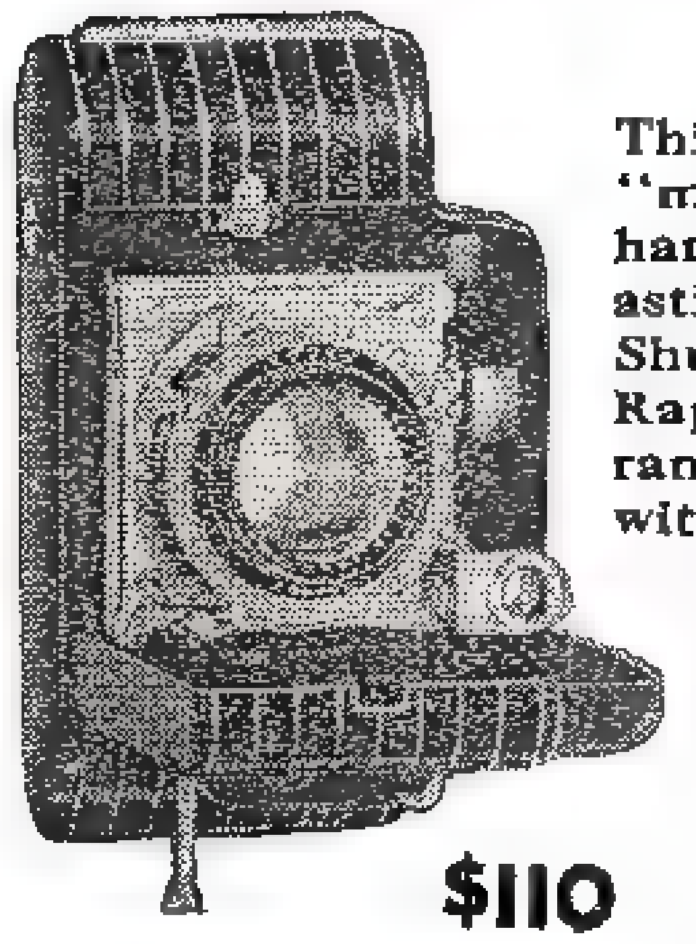


KODAK RETINA

$5750

Concentrated photographic versatility . . . lens, anastigmat *f*.3.5; shutter, Compur-Rapid—9 speeds up to 1/500 second. Loads with any of five different Kodak Film Magazines (including new Kodachrome for full-color transparencies). Negative size approximately 1 x 1½ inches. Price, $57.50.

KODAK BANTAM SPECIAL



$110

This exquisitely made "miniature" fits the hand. Lens, Kodak Anastigmat EKTAR *f*.2.0. Shutter, 1/500 Compur-Rapid. Military-type range finder, coupled with focusing mechanism. Makes needle-sharp negatives for superb enlargements (low-cost size, 2¼ x 4 inches); or Kodachrome transparencies. Price, $110.

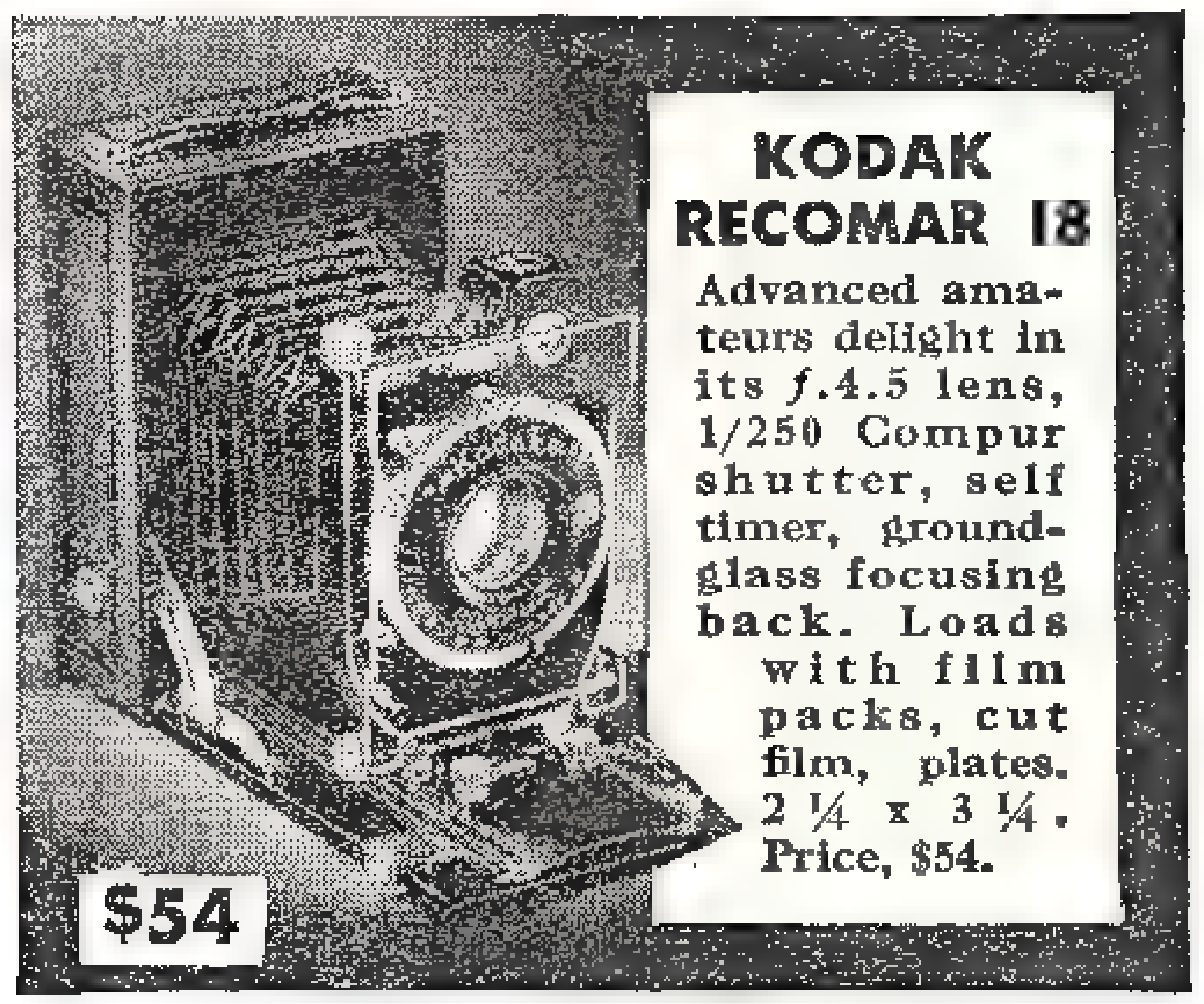
FOR THOSE WHO LIKE THEM LARGER

Precision Kodaks

KODAK SIX-16 (f.4.5)

Smallest folding camera taking 2½ x 4¼-inch pictures. *F*.4.5 lens; 1/400 Compur-Rapid shutter. Price, $40. (With *f*.6.3 lens, $20; with Doublet lens, $16.)

$40



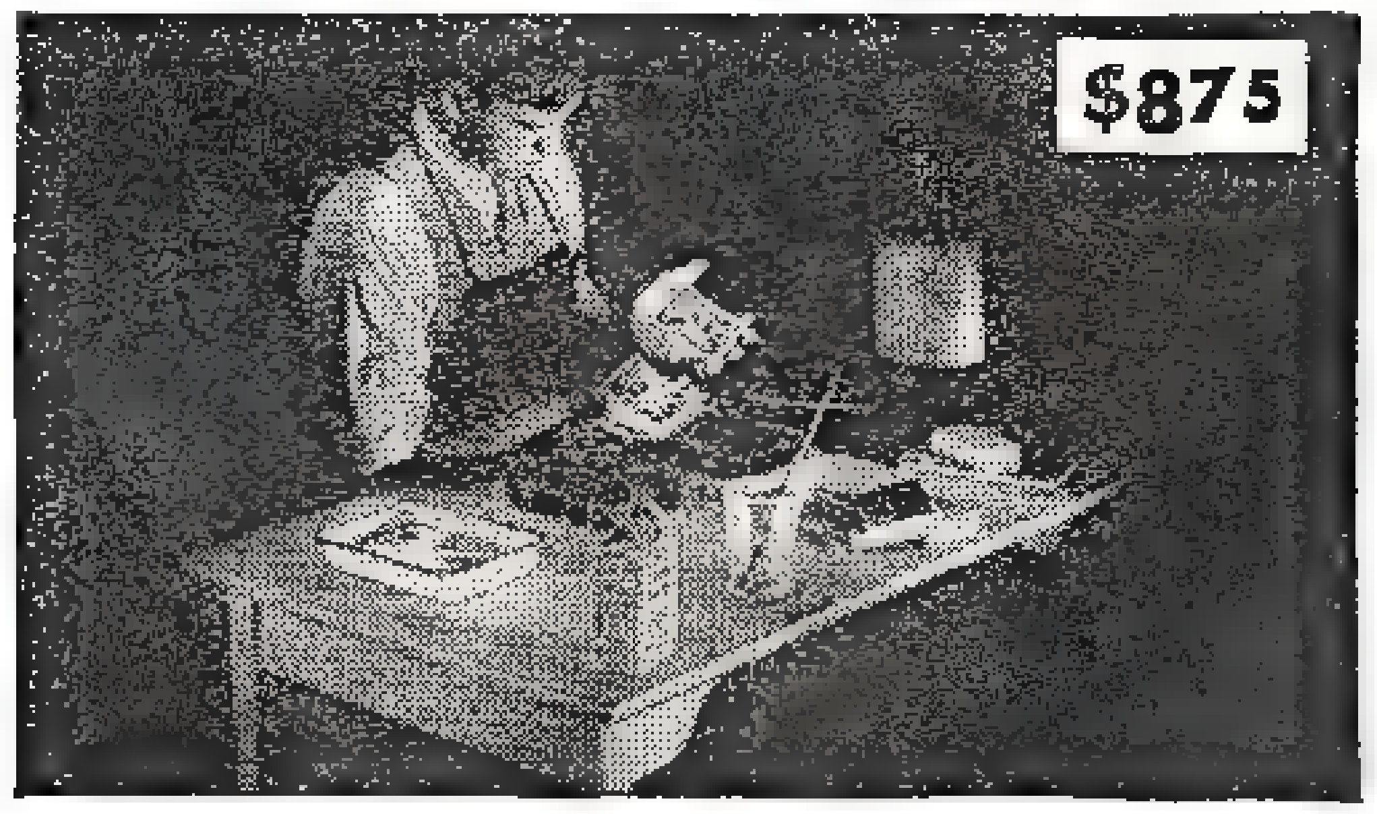
KODAK RECOMAR 18

Advanced amateurs delight in its *f*.4.5 lens, 1/250 Compur shutter, self timer, ground-glass focusing back. Loads with film packs, cut film, plates. 2¼ x 3¼. Price, $54.

$54

KODAK DARKROOM OUTFIT NO. 1

Contains trays, chemicals, developing clips, safelight, printing frame, thermometer, instruction booklet—everything necessary for first-class work. Also includes the book, "How to Make Good Pictures." Price, complete, $8.75.



$875

FOR THOSE WHO WANT MOTION

Ciné-Kodaks

$3450

CINÉ-KODAK EIGHT

Movies at "10 cents a shot"! The "Eight" makes it possible. A roll of Ciné-Kodak Eight Panchromatic Film costs only $2.25, *finished, ready to show.* Good for 20 to 30 black-and-white movie "shots," each as long as the average scene in the newsreels. Price, $34.50.

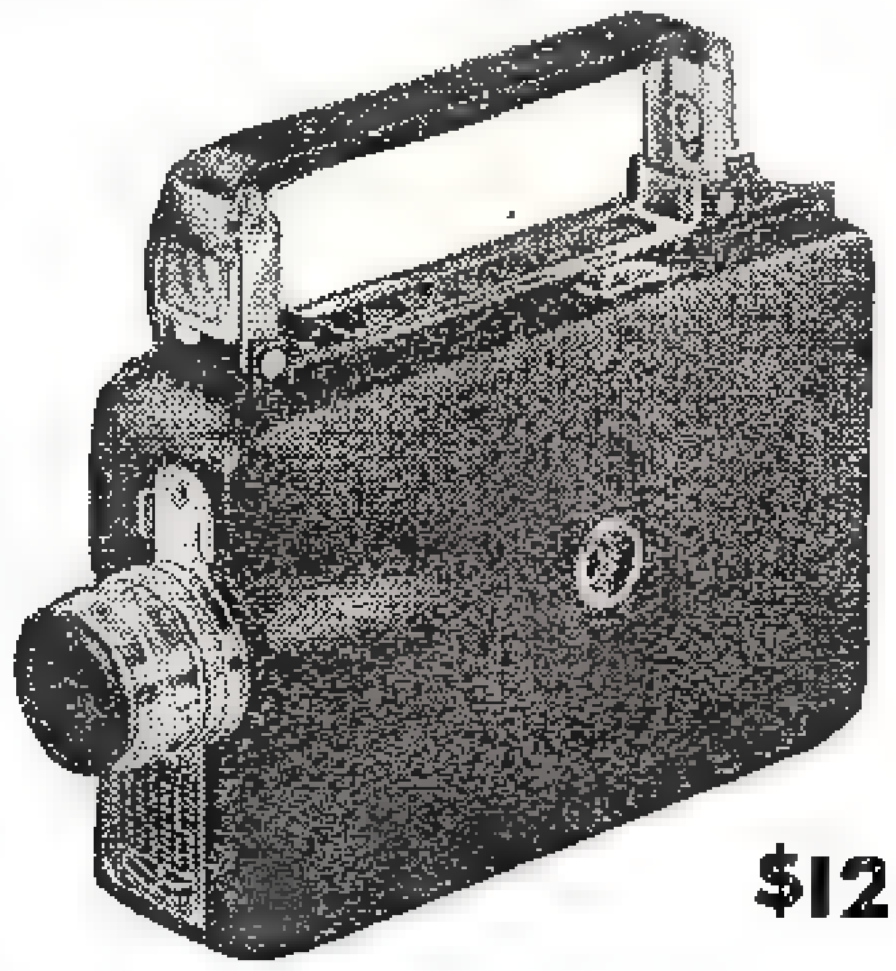
CINÉ-KODAK "K"

Most widely used 16 mm. home movie camera—it's so simple, yet so fine. Makes clear, brilliant movies at the touch of a button. And as the user's skill increases, responds to every exacting demand. Loads with full 100 feet of 16 mm. film. With *f*.1.9 lens, $112.50.

$11250

MAGAZINE CINÉ-KODAK

Loads in 3 seconds. Slip in the magazine, close camera cover, and shoot. And you can switch to another film in a jiffy, even when but part of the 16 mm. film has been exposed. Effortless loading is only one of six new features. With *f*.1.9 lens, $125 . . . Eastman Kodak Company, Rochester, N. Y.



$125

ALL CINÉ-KODAKS MAKE FULL-COLOR MOVIES ON KODACHROME FILM

Behind The Razor Blade

[*Continued from page* 61]

breakdown. The dies these men produce are accurate to one ten-thousandth of an inch.

After perforating, the blade strip is gauged for centrality—a measurement from the center slot to either edge. This distance must be held constant. The importance of accuracy here can scarcely be over-emphasized, since centrality of the slot controls the proper positioning of the blade in the razor.

Since the hardening process requires a surface absolutely clean, the coils of steel are "laundered" in the de-greasing machine immediately before entering the hardening furnace. The de-greaser passes the perforated coil through a soda wash, through high pressure jets of water just under the boiling point, through blasts of compressed air, a scrubbing box, a tank of special grease solvents, through jets of live steam, and finally compressed air again.

The razor blade makers were the first to recognize the fact that steel received from the rolling mill cannot be uniform, even in a single coil, and that to produce a uniform finished product, the temperature of the hardening furnace must fluctuate to compensate for these variations.

Since the furnaces maintain a temperature of approximately 1500 degrees Fahrenheit, and the difference between a good and a bad blade can be affected by a change of only 10 or 12 degrees, the control for the hardening furnace must be extremely sensitive and entirely automatic.

A "magic black box," situated midway of each furnace, furnishes this automatic control. A master strip of steel of exactly the correct temper is inserted in this box. If the steel in process does not match this master strip exactly in hardness, the magic box flashes an impulse to a control panel regulating a battery of automatic switches, and the amount of electricity flowing to the furnace is altered the required amount to bring the steel to the desired standard.

It is in the hardening furnace that the distinctive blue effect of a blade is obtained. A patented apparatus feeds a special mixture of gases to the furnaces, and the blue becomes part of the steel itself.

As the strip of steel leaves the hardening furnace it passes through the tempering plates that make the center section easy to flex when the blade is placed in the razor. A coat of rustproofing oil is then applied before the coil is rewound.

Samples are broken off of each coil after it leaves the furnace, to be submitted to a hardness test under a diamond-pointed instrument. If a sample fails to meet the required standard the whole coil is rejected and the furnace is stopped until the trouble can be found and remedied.

These samples are then sent to the cathode ray oscillograph—the electro-magnetic tester previously described. Variations of hardness and temper, or any hidden flaws or strains, are revealed here by a green line of light flashing on the fluorescent face of the oscillograph cathode ray tube. So accurate is this device that the passing of a sample through the flame of a match will cause a variation of hardness great enough to bring about a rejection. Next is a bending test to make sure the center of the blade will flex in the razor.

Having passed these tests, the coil of steel, now perforated, hardened and tempered, is run through a series of delicate gauges, to again determine that the breadth, thickness and centering are uniform.

The approved steel is again passed through the "laundry," after which it goes to the etching machines, where the trade mark and other distinctive lettering are etched on the metal with acid.

After another examination, the coil is sent to the sharpening machine. Two sets of grinding wheels, one for each edge, first remove the rough stock. Next the honing wheels, cutting at a different angle from the grinders, produce a perfect bevel on each edge.

After being honed, the blades are washed clean and dried with compressed air before passing on to the stroppers of specially tanned leather. Each blade is finished on 280 feet of sharpening surface while passing through this machine.

Inspectors stationed at the ends of the finishing machines submit their blades to tests with microscopes and gauges, finishing the test by cutting hair with the blades.

Samples from the finishers are also sent continually to the laboratory for examination by a photo-electric sharpness comparator. This machine measures the area of the blade edge with a beam of light. As the light traces down the length of the blade, a dot is thrown on a ground glass.

With cross-section paper placed over the glass, a girl traces a graph of the blade's edge. If the graph is straight, or nearly so, the blade is satisfactory. If it is saw-toothed, irregular, something is wrong with the grinding machine. That machine is stopped immediately, and the blades it has finished must be rejected.

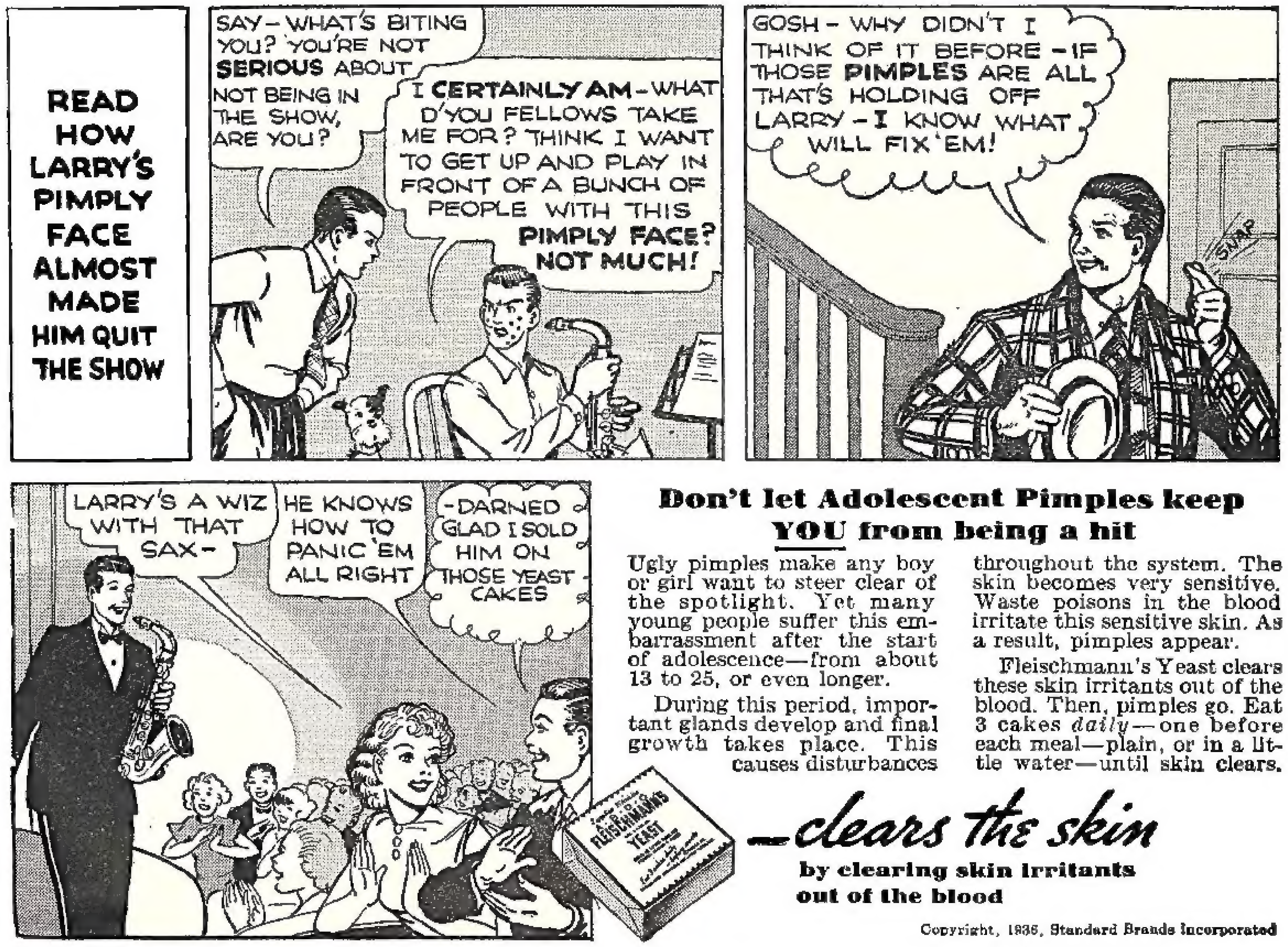
The finished blades now go to a room which at first glance you would take to be a library. Girls are studiously pouring over, not books, but stacks of blades. Every blade that leaves the factory is inspected by these girls.

After passing this last barrier the blades are sprayed with a powerful antiseptic solution, after which they are immediately wrapped, sealed in a wax-paper envelope and an outside wrapper.

In an endeavor to improve its product the Gillette Company has several inventors on salary, constantly working on new developments for the razor and blade.

And all so you won't wear whiskers.

NOW LISTEN, LARRY —YOU CAN'T BACK OUT!
NEXT DAY
TAKE IT FROM ME, LARRY—THESE YEAST CAKES ARE SLICK STUFF TO FINISH OFF PIMPLES—JUST YOU START EATING 'EM RIGHT OFF!
GEE CHARLIE—YOU SURE ARE ONE SWELL GUY!
LATER
HEY CHARLIE—TAKE A SQUINT AT MY FACE—THAT FLEISCHMANN'S YEAST WORKED
WELL I TOLD YOU IT WOULD CHASE THOSE BLOSSOMS—DIDN'T I?


READ HOW LARRY'S PIMPLY FACE ALMOST MADE HIM QUIT THE SHOW
SAY—WHAT'S BITING YOU? YOU'RE NOT SERIOUS ABOUT NOT BEING IN THE SHOW, ARE YOU?
I CERTAINLY AM—WHAT D'YOU FELLOWS TAKE ME FOR? THINK I WANT TO GET UP AND PLAY IN FRONT OF A BUNCH OF PEOPLE WITH THIS PIMPLY FACE? NOT MUCH!
GOSH—WHY DIDN'T I THINK OF IT BEFORE—IF THOSE PIMPLES ARE ALL THAT'S HOLDING OFF LARRY—I KNOW WHAT WILL FIX 'EM!
SNAP
LARRY'S A WIZ WITH THAT SAX—
HE KNOWS HOW TO PANIC 'EM ALL RIGHT
—DARNED GLAD I SOLD HIM ON THOSE YEAST CAKES
FLEISCHMANN'S YEAST

Don't let Adolescent Pimples keep YOU from being a hit

Ugly pimples make any boy or girl want to steer clear of the spotlight. Yet many young people suffer this embarrassment after the start of adolescence—from about 13 to 25, or even longer.

During this period, important glands develop and final growth takes place. This causes disturbances throughout the system. The skin becomes very sensitive. Waste poisons in the blood irritate this sensitive skin. As a result, pimples appear.

Fleischmann's Yeast clears these skin irritants out of the blood. Then, pimples go. Eat 3 cakes *daily*—one before each meal—plain, or in a little water—until skin clears.

—clears the skin

by clearing skin irritants out of the blood

Copyright, 1936, Standard Brands Incorporated

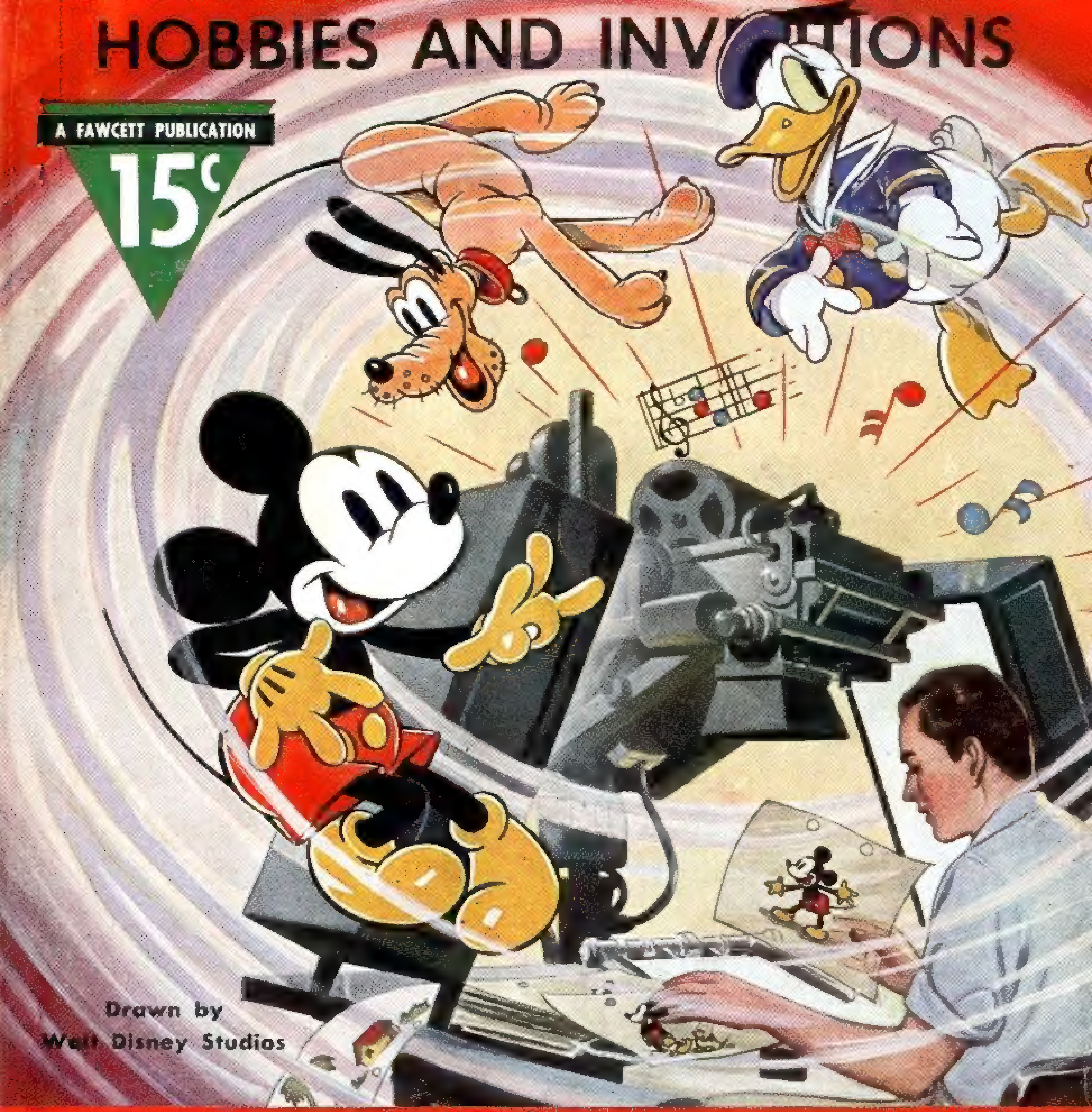
Alt. Cover

JANUARY

MODERN MECHANIX

HOBBIES AND INVENTIONS

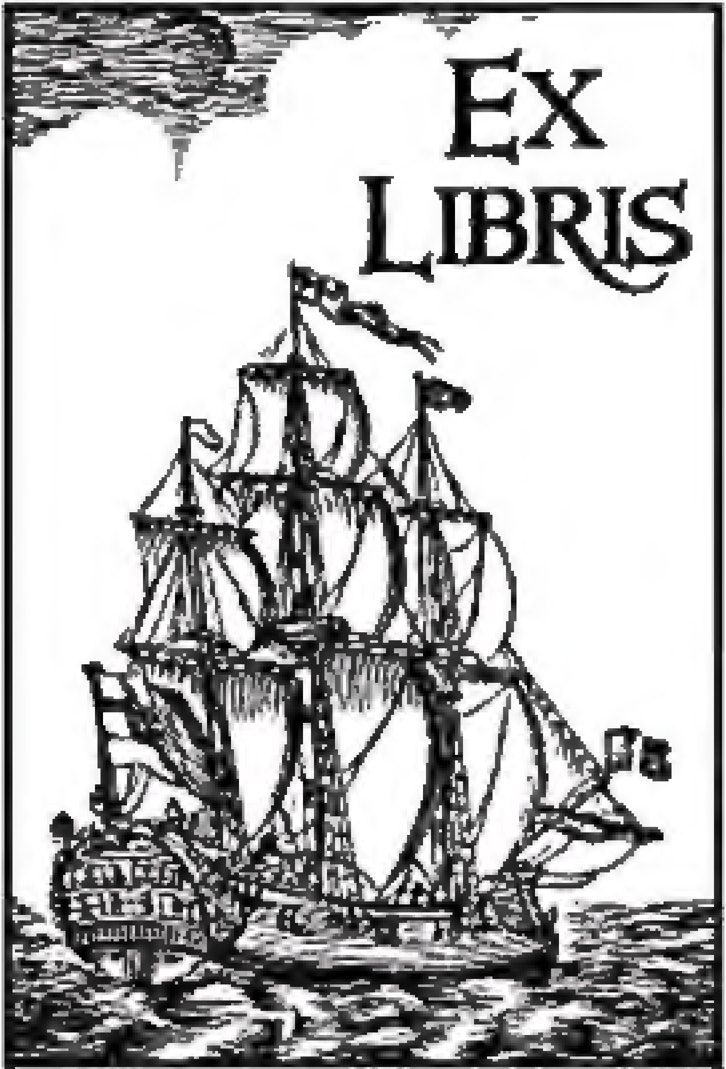
A FAWCETT PUBLICATION
15¢



Drawn by
Walt Disney Studios

Mickey Mouse Sound Tricks Revealed

GREAT INVENTIONS OF FAMOUS MEN



Anon. Malefactor